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Ontario Department of Education

Examination Papers

1966

Grade 12 Departmental Examinations

DEPARTMENT OF EDUCATION, ONTARIO

GRADE 12 DEPARTMENTAL EXAMINATIONS, 1966

LATIN

TIME — 2 HOURS

Note 1. *Your name and form, and the name of your school, are to be written clearly on each examination book and on the folder for Part C, which is to be handed in with your examination book.*

Note 2. *All answers for Parts A and B should be written on alternate lines.*

Note 3. *The Presiding Officer will provide you with the whole paper, including Part C, at the beginning of the examination period. Part C may be answered at any time during the examination period.*

PART A

I. (*The mark for Question I will be approximately 5% of the total.*)

Each of the English sentences below is followed by an incomplete Latin translation. Complete the Latin translation. Write the answer in your examination book.

1. I shall arrive at the first hour. .... perveniam.
2. He advanced one mile. .... progressus est.
3. Where was I to go? Quo ....?
4. Let us spare the prisoners. Captivis ....
5. The city must be attacked at once. Urbs statim .... est.

II. (*The mark for Question II will be approximately 35% of the total.*)

Translate into Latin.

1. After hearing this we collected a very large fleet.
2. If he had come, he would have captured more ships.
3. They reached Rome so quickly that the leaders made peace.
4. We said that we had not seen the boys there.
5. The ambassador who had been sent asked when the forces had left the camp.
6. The boys worked for many days in order to have enough money.
7. There will be fierce resistance since the citizens are experienced in fighting.
8. He hopes to persuade his sons not to surrender.

PART B

III. (*The mark for Question III will be approximately 16% of the total.*)

Translate into English.

(*The Suebi return home from the Rhine*)

Hoc proelio nuntiato Suebi, qui ad ripas fluminis Rheni venerant, domum reverti coeperunt; ubi ei qui prope Rhenum incolunt senserunt Suebos perterritos esse, insecuti magnum ex eis numerum interfecerunt. Caesar, duobus maximis bellis una aestate confectis, paulo maturius quam tempus anni postulabat in hiberna exercitum deduxit. Cum Labienus, legatus fidelissimus, castris praeesset, ipse in Italiam profectus est.

maturius (adverb) — earlier

CONTINUED OVER→

IV. *(The mark for Question IV will be approximately 13% of the total.)*

Translate into English.

(Cicero writes to a friend who is ill in Athens)

Nunc ego te hortor ut omnem diligentiam adhibeas ad convalescendum. Scio te omnia facturum esse ut mecum quam primum sis: sed tamen spero te non properaturum esse. Mare enim magnum et difficile tibi transeundum est: rogo ne ad Italiam transire coneris nisi sine periculo venire possis.

adhibeo—I apply, use
convalesco—I get well, recover
propero—I hurry

V. *(The mark for Question V will be approximately 3% of the total.)*

Write out the following two lines of the Aeneid, mark the scansion, and name the metre. The translation is given to help you, but it should not be written out.

Cerberus haec ingens latratu regna trifauci
personat adverso recubans immanis in antro.

(Translation: Huge Cerberus makes this kingdom echo with the barking from his three throats as he lies with his huge bulk in the cave opposite.) (N.B. Cerberus was the watch-dog of the Underworld.)

VI. *(The mark for Question VI will be approximately 6% of the total.)*

Do NOT write a translation of the following Latin sentences. Read them carefully and then answer in *English* the questions about *each* sentence.

1. Postero die rex Gallorum, de timore Romanorum certior factus, barbaros in urbem ducit et Romam incendi iubet.
   (*a*) What information had the king received?
   (*b*) What command did the king give?

2. Nuntius Romam statim missus Romanis nuntiavit Camillum bellum parare et cum auxiliis quam maximis celeriter venturum esse.
   (*a*) What did the messenger say that Camillus was doing?
   (*b*) How large a relief force was Camillus going to bring with him?

3. Proelio commisso, Manlius, qui dextro cornu praeerat, hostes pepulit, sed alterum cornu, cui Decius ipse praefectus erat, premebatur ab hostibus et pedem referre coepit.
   (*a*) What success did Manlius have in the battle?
   (*b*) Who had been put in charge of the left wing?
   (*c*) What did the left wing do when it was hard pressed?

4. Curio, cohortibus quinque castris praesidio relictis, quarta vigilia exiit; progressus milia passuum quattuor, septem custodes hostium cepit qui casu in statione dormiebant. Quos rogavit quis castris prope flumen positis praeesset.
   (*a*) At what time did the incident mentioned occur?
   (*b*) What precaution did the general Curio take before his departure?
   (*c*) What major violation of military discipline is mentioned in the above passage?
   (*d*) What information did Curio seek?

DEPARTMENT OF EDUCATION, ONTARIO

GRADE 12 DEPARTMENTAL EXAMINATIONS, 1966

LATIN

PART C

....
NAME

....
SCHOOL FORM

....
NAME OF SCHOOL

(*The mark for this Part will be approximately* 22% *of the total.*)

NOTE 1. *All items in this Part are equal in value.*

NOTE 2. *Only those answers which are indicated in the answer column at the right will be marked.*

VII. There are five suggestions for completing each of the following incomplete statements. In each case select the correct completion and *circle* its letter in the answer column at the right.

1. The correct form of *hic* to agree with *oppida* is
(A) hac (B) haec (C) hoc (D) hae (E) hanc

1.
A B C D E

2. The correct form of *noster* to agree with *amicis* is
(A) nostris (B) nobis (C) nos (D) nostrum (E) nostras

2.
A B C D E

3. The correct form of *nullus* to agree with *artis* is
(A) nullae (B) nulli (C) nullius (D) nullis (E) nullo

3.
A B C D E

4. The positive degree of *pessimus* is
(A) malus (B) parvus (C) peius (D) plus (E) melius

4.
A B C D E

5. The comparative of *miser* is
(A) misere (B) miserius (C) miserrimus (D) miserimus (E) miserior

5.
A B C D E

6. The ablative singular of *mors* is
(A) morti (B) more (C) mori (D) morte (E) mora

6.
A B C D E

7. The present infinitive passive of *audio* is
(A) audi (B) audire (C) audiri (D) audere (E) audivere

7.
A B C D E

8. The second person singular of the present indicative passive of *fero* is
(A) fereris (B) ferris (C) feres (D) feraris (E) fers

8.
A B C D E

9. The third person singular of the imperfect subjunctive of *volo* is
(A) velit (B) vellet (C) volet (D) volebat (E) vult

9.
A B C D E

10. The second person singular of the present imperative of *moror* is
(A) moreris (B) mori (C) morari (D) morare (E) moraris

10.
A B C D E

***CONTINUED OVER*→**

VIII. After reading the following Latin passage, select the one of the four choices following each question which best completes the statement or answers the question, and *circle* its letter in the answer column at the right.

(Papirius, a Roman boy, visits the senate)

Mos antea senatoribus Romae fuit in senatum cum filiis inire. Ibi magnae res secreto agebantur. Mater Papirii, qui cum patre suo in senatu fuerat, filium rogavit quid patres ibi egissent. Cui ille respondit nihil sibi dicendum esse. Itaque mater facta est multo cupidior audiendi. Tum puer, matre premente, quod nolebat dicere quae gesta essent, bonum consilium cepit. "Alii," inquit, "sentiunt aequum esse unum virum duas uxores habere; alii credunt aequum esse unam feminam duos coniuges habere."

Quibus rebus auditis, mater perturbata reliquas matronas certiores fecit. Venit igitur ad senatum postero die matrum multitudo. Patres, attoniti, non intellegebant cur matres eo convenissent. Papirius autem in medium senatum progressus, narravit quid mater audire voluisset et quid ipse matri dixisset. Senatores, fide pueri laudata, imperaverunt ne postea pueri cum patribus in senatum inirent, nisi ille unus Papirius.

1. The story concerns a boy
   (A) who shamelessly betrayed the senate
   (B) whose mother betrayed the senate
   (C) whose father was forbidden to enter the senate
   (D) who loyally protected the senate

1. A B C D

2. The mother asked her son
   (A) where the senators had driven
   (B) what the senators had discussed
   (C) why the senators had taken action
   (D) what senators had acted

2. A B C D

3. *nihil sibi dicendum esse* (line 3) would be best translated by
   (A) that he had nothing to say for himself
   (B) that there was nothing to be said in his favour
   (C) that he had nothing to say
   (D) that he must say nothing

3. A B C D

4. The words *Itaque...audiendi* (lines 3 and 4) suggest that the mother
   (A) became much more eager to hear
   (B) made him eager to hear more
   (C) made him much more eager to hear
   (D) listened much more lovingly

4. A B C D

5. The words *matre premente* (line 4) suggest that the mother
   (A) made promises
   (B) pressed for more information
   (C) had a premonition
   (D) punished the boy

5. A B C D

6. The boy said that some of the senators thought
   (A) that a man should have a horse and two wives
   (B) that a man should have two wives of equal status
   (C) that the two wives of the man should have water
   (D) that it was right for one man to have two wives

6. A B C D

7. The words *Venit...multitudo* (lines 8 and 9) reveal that
   (A) the senate sent the last god to the multitude of mothers
   (B) a crowd of mothers came to the senate the next day
   (C) the senate came the next day to the crowd of mothers
   (D) when the next day came, the crowd of mothers departed

7. A B C D

8. The senators were surprised because
(A) they did not know why the mothers had assembled there
(B) they did not know who had informed the mothers of the meeting
(C) they thought that the meeting was to be held on the next day
(D) men and women rarely attended meetings together

8. A B C D

9. As a result of this incident the senate decreed that in future
(A) no boys should enter the senate unless accompanied by their fathers
(B) no boys should enter the senate with their fathers unless Papirius came
(C) only Papirius could not enter the senate with his father
(D) no boys except Papirius should accompany their fathers into the senate

9. A B C D

10. The story illustrates the boy's
(A) ingenuity
(B) stupidity
(C) treachery
(D) unreliability

10. A B C D

11. The word *Mos* (line 1) means
(A) soon (B) character (C) custom (D) delay

11. A B C D

12. *audiendi* (line 4) is part of the verb *audio* and is a
(A) gerundive
(B) gerund
(C) present participle active
(D) present infinitive passive

12. A B C D

13. The word *virum* as used in (line 6) is
(A) subject of *esse*
(B) object of *sentiunt*
(C) subject of *habere*
(D) object of *habere*

13. A B C D

14. *alii* (line 6) would be best translated by
(A) others (B) all (C) the others (D) any

14. A B C D

15. Which of the following words is closest in meaning to *credunt* (line 6)?
(A) cognoscunt (B) vident (C) sciunt (D) existimant

15. A B C D

16. Which of the following parts of speech is *eo* (line 10)?
(A) verb (B) adverb (C) pronoun (D) adjective

16. A B C D

17. Which of the following expressions does NOT translate *progressus* (line 10-11)?
(A) having been moved forward
(B) after he had come forward
(C) coming forward
(D) who had come forward

17. A B C D

18. A word expressing the same meaning as *autem* (line 10) is
(A) enim (B) tandem (C) tamen (D) itaque

18. A B C D

19. The word *dixisset* (line 11) is in the subjunctive mood because it is the verb in
(A) a subordinate clause in indirect discourse
(B) a relative clause of purpose
(C) an indirect command
(D) an indirect question

19. A B C D

20. The word *fide* as used in (line 12) is an ablative
(A) of means
(B) of manner
(C) in an ablative absolute
(D) of description

20. A B C D

CONTINUED OVER→

IX. There are five suggested meanings for the italicized words in the following sentences. In each case, from your knowledge of Latin, select the meaning which is nearest to that of the italicized word and *circle* its letter in the answer column at the right.

1. The new recruits *impeded* the army's progress.
   (A) assisted
   (B) hindered
   (C) improved
   (D) accelerated
   (E) announced

1\.
A B C D E

2. The students enjoyed their lesson with the *itinerant* teacher.
   (A) popular
   (B) versatile
   (C) travelling
   (D) inspiring
   (E) temporary

2\.
A B C D E

3. The *ostentation* of the consul annoyed the people.
   (A) gaudy display
   (B) harsh injustice
   (C) extreme inflexibility
   (D) haughty arrogance
   (E) constant indecision

3\.
A B C D E

4. Using a correct *aperture* plays an important part in photography.
   (A) speed of exposure
   (B) composition
   (C) focus
   (D) technique
   (E) lens opening

4\.
A B C D E

X. In each of the following groups of words four are derived from the one Latin word. Select the one word in each group which is *not* derived from the same Latin word as the other *four* and *circle* its letter in the answer column at the right.

1\.
(A) tangible
(B) tangent
(C) tactics
(D) intact
(E) contact

1\.
A B C D E

2\.
(A) captive
(B) decapitate
(C) deceptive
(D) receipt
(E) exception

2\.
A B C D E

3\.
(A) query
(B) quest
(C) inquisitive
(D) inquiry
(E) quarrelsome

3\.
A B C D E

XI. In each of the next three questions five pairs of words are given, the first a Latin word, the second an English word. In four of the pairs the English word is derived from the accompanying Latin word. Select the pair in which the English word is *not* derived from the accompanying Latin word and *circle* its letter in the answer column at the right.

1\.
(A) *vita,* vital
(B) *insidiae,* insidious
(C) *ager,* agricultural
(D) *legio,* legislate
(E) *oratio,* oration

1\.
A B C D E

2\.
(A) *spes,* special
(B) *frater,* fraternal
(C) *civis,* civilian
(D) *salus,* salutary
(E) *vir,* virile

2\.
A B C D E

3\.
(A) *vox,* vocal
(B) *gratia,* gratitude
(C) *domus,* domicile
(D) *mare,* mare
(E) *os,* oral

3\.
A B C D E

DEPARTMENT OF EDUCATION, ONTARIO

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LATIN

TEMPS — 2 HEURES

NOTE 1. *Votre nom, votre classe et le nom de votre école doivent être clairement inscrits sur chaque cahier d'examen, ainsi que sur le livret contenant la Partie C que vous devez retourner avec votre cahier d'examen.*

NOTE 2. *Toutes les réponses aux Parties A et B doivent être écrites à toutes les deux lignes.*

NOTE 3. *Le surveillant vous remettra l'ensemble de l'examen, y compris la Partie C, au début des deux heures. Vous pourrez répondre aux questions de la Partie C à n'importe quel moment de la durée de l'examen.*

PARTIE A

I. (*On accordera à la question I environ 5% du total des points.*)

Chacune des phrases suivantes est accompagnée d'une traduction latine incomplète. Complétez cette traduction. Indiquez votre réponse dans votre cahier d'examen.

1. J'arriverai à la troisième heure. .... perveniam.
2. Il a parcouru un mille. .... progressus est.
3. Où devais-je aller? Quo .... ?
4. Epargnons les prisonniers. Captivis ....
5. On doit attaquer la ville tout de suite. Urbs statim .... est.

II. (*On accordera à la question II environ 35% du total des points.*)

Traduisez en latin.

1. Après avoir entendu ces choses, nous avons rassemblé une très grande flotte.
2. S'il était venu, il aurait pris un plus grand nombre de bateaux.
3. Ils parvinrent à Rome si rapidement que les chefs firent la paix.
4. Nous avons dit que nous n'avions pas vu les garçons là.
5. L'ambassadeur qui avait été envoyé demanda à quel moment les troupes avaient quitté le camp.
6. Les garçons ont travaillé plusieurs jours pour avoir assez d'argent.
7. On résistera farouchement puisque les citoyens sont habiles à combattre.
8. Il espère persuader ses fils de ne pas se rendre.

PARTIE B

III. (*On accordera à la question III environ 16% du total des points.*)

Traduisez en français.

(*Le retour des Suèves du Rhin*)

Hoc proelio nuntiato Suebi, qui ad ripas fluminis Rheni venerant, domum reverti coeperunt; ubi ei qui prope Rhenum incolunt senserunt Suebos perterritos esse, insecuti magnum ex eis numerum interfecerunt. Caesar, duobus maximis bellis una aestate confectis, paulo maturius quam tempus anni postulabat in hiberna exercitum deduxit. Cum Labienus, legatus fidelissimus, castris praeesset, ipse in Italiam profectus est.

maturius (adverbe) — plus tôt

—TOURNEZ→

IV. (*On accordera à la question IV environ 13% du total des points.*)

Traduisez en français.

(*Cicéron écrit à un ami qui est malade à Athènes*)

Nunc ego te hortor ut omnem diligentiam adhibeas ad convalescendum. Scio te omnia facturum esse ut mecum quam primum sis: sed tamen spero te non properaturum esse. Mare enim magnum et difficile tibi transeundum est: rogo ne ad Italiam transire coneris nisi sine periculo venire possis.

adhibeo—j'emploie, mets
convalesco—je prends du mieux, recouvre la santé
propero—je me hâte

V. (*On accordera à la question V environ 3% du total des points.*)

Ecrivez les deux vers ci-dessous de l'Enéide, faites-en la scansion, et dites la sorte de mètre. La traduction qui suit n'est qu'un guide: vous ne devez pas l'écrire dans votre cahier.

Cerberus haec ingens latratu regna trifauci
personat adverso recubans immanis in antro.

(Traduction: Là, l'énorme Cerbère de ses trois gueules aboyantes fait retentir le royaume des morts, monstre couché dans un antre en face du débarcadère.) (N.B. Cerbère était le chien, gardien des Enfers.)

VI. (*On accordera à la question VI environ 6% du total des points.*)

NE traduisez PAS les phrases latines suivantes. Lisez-les attentivement et répondez en *français* aux questions posées sur *chacune.*

1. Postero die rex Gallorum, de timore Romanorum certior factus, barbaros in urbem ducit et Romam incendi iubet.
   (*a*) Quel renseignement le roi avait-il obtenu?
   (*b*) Quel ordre le roi donna-t-il?

2. Nuntius Romam statim missus Romanis nuntiavit Camillum bellum parare et cum auxiliis quam maximis celeriter venturum esse.
   (*a*) Que faisait Camille d'après l'annonce du messager?
   (*b*) Décrivez la puissance des renforts que Camille devait amener avec lui?

3. Proelio commisso, Manlius, qui dextro cornu praeerat, hostes pepulit, sed alterum cornu, cui Decius ipse praefectus erat, premebatur ab hostibus et pedem referre coepit.
   (*a*) Quel fut le succès remporté par Manlius durant le combat?
   (*b*) Qui avait-on placé à la tête de l'aile gauche?
   (*c*) Que fit l'aile gauche lorsqu'elle se vit pressée?

4. Curio, cohortibus quinque castris praesidio relictis, quarta vigilia exiit; progressus milia passuum quattuor, septem custodes hostium cepit qui casu in statione dormiebant. Quos rogavit quis castris prope flumen positis praeesset.
   (*a*) A quel moment se situe l'anecdote relaté ci-haut?
   (*b*) De quoi le général Curio s'est-il assuré avant de partir?
   (*c*) Quel manquement grave à la discipline militaire est évoqué dans le texte ci-haut?
   (*d*) Quel renseignement Curio a-t-il tenté d'obtenir?

DEPARTMENT OF EDUCATION, ONTARIO

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LATIN

PARTIE C

....
Nom

....
Classe

....
Nom de l'école

(*On accordera à cette partie environ 22% du total des points.*)

NOTE 1. *Toutes les réponses à cette partie sont d'égale valeur.*

NOTE 2. *On n'évaluera que les réponses indiquées à la colonne des réponses à droite.*

VII. On vous suggère un choix de cinq réponses pour compléter les phrases suivantes. Pour chacune, choisissez celle qui complète le mieux la phrase et encerclez dans la colonne de droite la lettre qui désigne votre réponse.

1. Pour s'accorder avec *oppida, hic* doit s'écrire
(A) hac (B) haec (C) hoc (D) hae (E) hanc
1. A B C D E

2. Pour s'accorder avec *amicis, noster* doit s'écrire
(A) nostris (B) nobis (C) nos (D) nostrum (E) nostras
2. A B C D E

3. Pour s'accorder avec *artis, nullus* doit s'écrire
(A) nullae (B) nulli (C) nullius (D) nullis (E) nullo
3. A B C D E

4. Le positif de *pessimus* est
(A) malus (B) parvus (C) peius (D) plus (E) melius
4. A B C D E

5. Le comparatif de supériorité de *miser* est
(A) misere (B) miserius (C) miserrimus (D) miserimus (E) miserior
5. A B C D E

6. L'ablatif singulier de *mors* est
(A) morti (B) more (C) mori (D) morte (E) mora
6. A B C D E

7. Le présent de l'infinitif passif de *audio* est
(A) audi (B) audire (C) audiri (D) audere (E) audivere
7. A B C D E

8. La deuxième personne du singulier du présent de l'indicatif passif de *fero* est
(A) fereris (B) ferris (C) feres (D) feraris (E) fers
8. A B C D E

9. La troisième personne du singulier de l'imparfait du subjonctif de *volo* est
(A) velit (B) vellet (C) volet (D) volebat (E) vult
9. A B C D E

10. La deuxième personne du singulier du présent de l'impératif de *moror* est
(A) moreris (B) mori (C) morari (D) morare (E) moraris
10. A B C D E

TOURNEZ →

VIII. Après avoir lu le passage latin suivant, choisissez parmi les quatre suggestions celle qui complète le mieux l'affirmation ou qui répond à la question, puis, encerclez dans la colonne des réponses à droite, la lettre qui désigne votre réponse.

(Papirius, un garçon romain, visite le sénat)

Mos antea senatoribus Romae fuit in senatum cum filiis inire. Ibi magnae res secreto agebantur. Mater Papirii, qui cum patre suo in senatu fuerat, filium rogavit quid patres ibi egissent. Cui ille respondit nihil sibi dicendum esse. Itaque mater facta est multo cupidior audiendi. Tum puer, matre premente, quod nolebat dicere quae gesta essent, bonum consilium cepit. "Alii," inquit, "sentiunt aequum esse unum virum duas uxores habere; alii credunt aequum esse unam feminam duos coniuges habere."

Quibus rebus auditis, mater perturbata reliquas matronas certiores fecit. Venit igitur ad senatum postero die matrum multitudo. Patres, attoniti, non intellegebant cur matres eo convenissent. Papirius autem in medium senatum progressus, narravit quid mater audire voluisset et quid ipse matri dixisset. Senatores, fide pueri laudata, imperaverunt ne postea pueri cum patribus in senatum inirent, nisi ille unus Papirius.

1. Cette anecdote est à propos d'un garçon
   (A) qui a trahi honteusement le sénat
   (B) dont la mère a trahi le sénat
   (C) dont le père ne pouvait entrer au sénat
   (D) qui a protégé le sénat loyalement

1.
A B C D

2. La mère demanda à son fils
   (A) jusqu'où les sénateurs étaient allés
   (B) ce que les sénateurs avaient discuté
   (C) pourquoi les sénateurs avaient agi
   (D) ce que les sénateurs avaient décidé

2.
A B C D

3. La meilleure traduction de *nihil sibi dicendum esse* (ligne 3) est
   (A) que lui-même n'avait rien à dire
   (B) qu'on ne pouvait rien dire en sa faveur
   (C) qu'il n'avait rien à dire
   (D) qu'il ne devait rien dire

3.
A B C D

4. Les mots *Itaque...audiendi* (lignes 3 et 4) signifient que la mère
   (A) était beaucoup plus désireuse de connaître
   (B) le rendit désireux d'en savoir d'avantage
   (C) le rendit plus désireux d'écouter
   (D) l'écouta avec plus de tendresse

4.
A B C D

5. L'expression *matre premente* (ligne 4) veut signifier que la mère
   (A) a fait des promesses
   (B) insistait pour plus de renseignements
   (C) avait un pressentiment
   (D) a puni le garçon

5.
A B C D

6. Le garçon déclara que certains sénateurs croyaient
   (A) qu'un homme devait avoir un cheval et deux femmes
   (B) qu'un homme devait avoir deux femmes dont le statut serait égal
   (C) que les deux épouses de l'homme devraient avoir de l'eau
   (D) qu'il était juste qu'un homme ait deux femmes

6.
A B C D

7. La phrase *Venit...multitudo* (ligne 8-9) nous apprend
   (A) que les sénateurs ont envoyé le dernier des dieux à la multitude des mères
   (B) qu'une foule de mères vint au sénat le lendemain
   (C) que le sénat le lendemain vint à la rencontre de la foule des mères
   (D) qu'au lendemain, la foule des mères s'éloigna

7.
A B C D

8. Les sénateurs étaient fort étonnés parce que
(A) ils ne savaient pas pourquoi elles s'étaient rassemblées là
(B) ils ne savaient qui les avaient averties de la réunion
(C) ils croyaient que la réunion devait avoir lieu le lendemain
(D) les hommes et les femmes ensemble n'assistaient que rarement aux assemblées

8. A B C D

9. À la suite de cet indicent, le sénat décréta qu' à l'avenir
(A) aucun garçon ne devait entrer au sénat sans être accompagné de son père
(B) aucun garçon ne devait entrer au sénat avec son père à moins que Papirius n'y vienne
(C) seul Papirius ne pouvait entrer au sénat avec son père
(D) aucun garçon, sauf Papirius, ne devait accompagner son père au sénat

9. A B C D

10. L'histoire fait ressortir chez le garçon
(A) son ingéniosité
(B) sa stupidité
(C) sa traîtrise
(D) son insouciance

10. A B C D

11. Quelle est le sens de *Mos* (ligne 1) ?
(A) bientôt (B) caractère (C) coutume (D) retard

11. A B C D

12. Quelle forme de *audio* est *audiendi* (ligne 4) ?
(A) adjectif verbal
(B) gérondif
(C) participe présent actif
(D) infinitif présent passif

12. A B C D

13. La fonction de *virum* (ligne 6) est
(A) sujet de *esse*
(B) complément d'objet de *sentiunt*
(C) sujet de *habere*
(D) complément d'objet de *habere*

13. A B C D

14. Quel mot traduit le mieux *alii* (ligne 6) ?
(A) autres (B) tous (C) les autres (D) tout

14. A B C D

15. Quel verbe se rapproche le plus de *credunt* (ligne 6) quant au sens?
(A) cognoscunt (B) vident (C) sciunt (D) existimant

15. A B C D

16. Quelle est la nature du mot *eo* (ligne 10) ?
(A) verbe (B) adverbe (C) pronom (D) adjectif

16. A B C D

17. Quelle expression NE traduit PAS *progressus* (ligne 10-11) ?
(A) ayant été poussé de l'avant
(B) après qu'il fut avancé
(C) s'avançant
(D) qui s'était avancé

17. A B C D

18. Le mot qui a le même sens que *autem* (ligne 10) est
(A) enim (B) tandem (C) tamen (D) itaque

18. A B C D

19. Le verbe *dixisset* (ligne 11) est un verbe au subjonctif dans une
(A) subordonnée dans le discours indirect
(B) relative au subjonctif (de but)
(C) complétive après un verbe de volonté
(D) interrogative indirecte

19. A B C D

20. *Fide* (ligne 12) est un ablatif
(A) de moyen
(B) de manière
(C) dans l'ablatif absolu
(D) descriptif

20. A B C D

TOURNEZ

IX. Pour chacun des mots en italiques dans les phrases suivantes, on suggère cinq significations. D'après votre connaissance du latin, choisissez dans chaque cas la signification qui vous semble rendre le mieux le sens du mot en italique et encerclez, dans la colonne de droite, la lettre qui désigne cette signification.

1. La dernière bataille l'a rendu *impotent*.
   (A) peu sage
   (B) invalide
   (C) impossible
   (D) brave
   (E) puissant

1. A B C D E

2. Les étudiants savourent les leçons de leur professeur *itinérant*.
   (A) populaire
   (B) versatile
   (C) nomade
   (D) encourageant
   (E) temporaire

2. A B C D E

3. *L'ostentation* du consul troublait le peuple.
   (A) démonstration exagérée
   (B) sévère injustice
   (C) intransigeance
   (D) arrogance choquante
   (E) hésitation constante

3. A B C D E

4. Pour réussir une bonne photographie, il faut une *aperture* précise.
   (A) vitesse focale
   (B) composition
   (C) focus
   (D) technique
   (E) ouverture de la lentille

4. A B C D E

X. Quatre des cinq mots donnés sont des dérivés du même mot latin. Trouvez le mot qui Ne va Pas dans chacune des listes de dérivés et encerclez dans la colonne des réponses, à droite, la lettre qui désigne ce mot.

1.
(A) tangible (B) tangeante (C) tactique (D) intact (E) contact

1. A B C D E

2.
(A) captif (B) décapiter (C) déçu (D) reçu (E) exception

2. A B C D E

3.
(A) question (B) quête (C) inquisiteur (D) enquête (E) querelleur

3. A B C D E

XI. Dans les trois dernières questions, vous verrez cinq couples de mots: le premier, un mot latin, le second, un mot français. Dans quatre de ces groupes, le mot français est dérivé du mot latin qui précède. Choisissez le groupe qui *n'établit pas* cette relation et encerclez dans la colonne des réponses, à droite, la lettre qui désigne ce groupe.

1.
(A) *vita*—vital
(B) *insidiae*—insidieux
(C) *rus*—rural
(D) *legio*—légiférer
(E) *oratio*—oraison

1. A B C D E

2.
(A) *spes*—spécifique
(B) *frater*—fraternel
(C) *civis*—civil
(D) *salus*—salutaire
(E) *vir*—viril

2. A B C D E

3.
(A) *vox*—vocal
(B) *gratia*—gratitude
(C) *domus*—domicile
(D) *mare*—maire
(E) *os*—oral

3. A B C D E

DEPARTMENT OF EDUCATION, ONTARIO

GRADE 12 DEPARTMENTAL EXAMINATIONS, 1966

GEOGRAPHY, PART II

TIME — 2 HOURS

NOTE 1. *Your name and form, and the name of your school, are to be written clearly on each examination book.*

NOTE 2. *Answer both questions in Part A, one question in Part B, and two questions in Part C.*

NOTE 3. *The presiding officer will provide a topographic map and a photograph for use in answering questions 1 and 2.*

NOTE 4. *Sketch maps and diagrams should be used wherever they will aid your answers.*

Approximate Values

PART A

Answer BOTH questions in Part A. (Allow approximately 22 minutes for each question.)

1. Refer to the topographic map provided and answer the following questions.

6 (*a*) Describe briefly the relief and drainage of *the area due north* of Boulder Canyon. (NOTE. Boulder Canyon is the narrow portion of Lake Mead between Boulder Basin and Virgin Basin.)

2 (*b*) To what physiographic region of the U.S.A. does the entire map area belong?

4 (*c*) Indicate the type of climate which exists in this area, giving proof from the map to support your answer.

6 (*d*) Describe and account for *three* types of land use.

2. Refer to the photograph provided and answer the following questions.

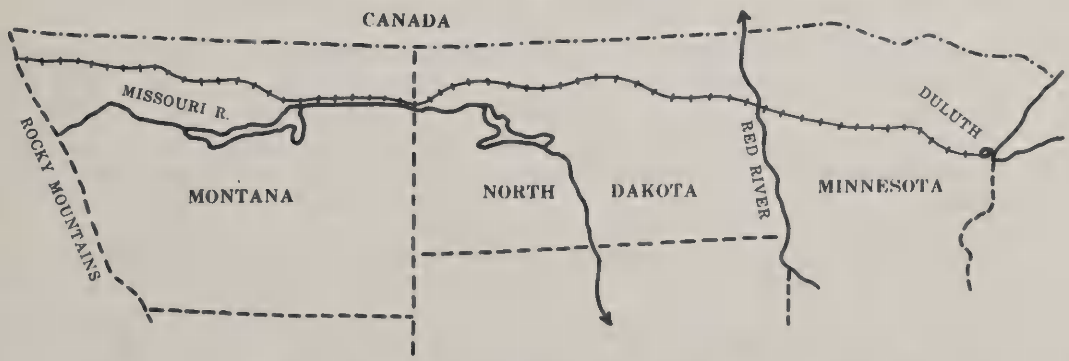
7 (*a*) Draw a simple cross-section of the river valley along the line AB. Identify and label *five* physical features encountered along this line.

4 (*b*) Explain briefly how any *one* landform feature represented in your cross-section was formed.

6 (*c*) Write a short geographical account of the land use pattern evident in *either* the upland *or* the lowland portion of the photograph.

PART B

Answer ONE question in Part B. (Allow approximately 32 minutes.)

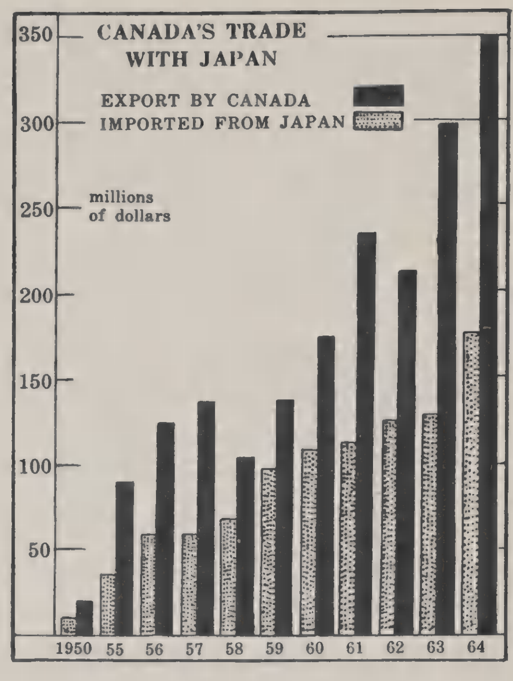


3. (*a*) The sketch map shown above illustrates the route of the Great Northern Pacific Railroad. Assuming that you take a journey from Duluth to the western boundary of Montana,

4 (1) list in order the physiographic (landform) regions which you would encounter
4 (2) describe the surface relief features of *any two* of the regions you have listed
7 (3) describe and account for the changes in natural vegetation which occur.

10 (*b*) Contrast land use practices in Montana and North Dakota, and show how these practices are characteristic of Great Plains agriculture.

CONTINUED OVER→



Approximate Values	
4	4. (*a*) (i) In what ways does the graph above indicate the problems faced by Japanese industry?
3	(ii) Is the trend indicated by the graph likely to continue for the next ten years? Justify your answer.
10	(*b*) With the aid of a sketch map, give an explanatory account of the industrial development of *either* the Osaka-Kobe region (Kinai Plain) *or* Northern Kyushu.
8	(*c*) Japan has tripled her output of manufactured goods in the last decade, and has moved into third place in world steel production. What role has its government played in this development?

PART C

Answer TWO questions in Part C. (Allow approximately 22 minutes for each question.)

12 5. (*a*) With reference to the quotation below, outline in not more than *two* or *three* sentences for each, the geographical significance of the italicized statements.

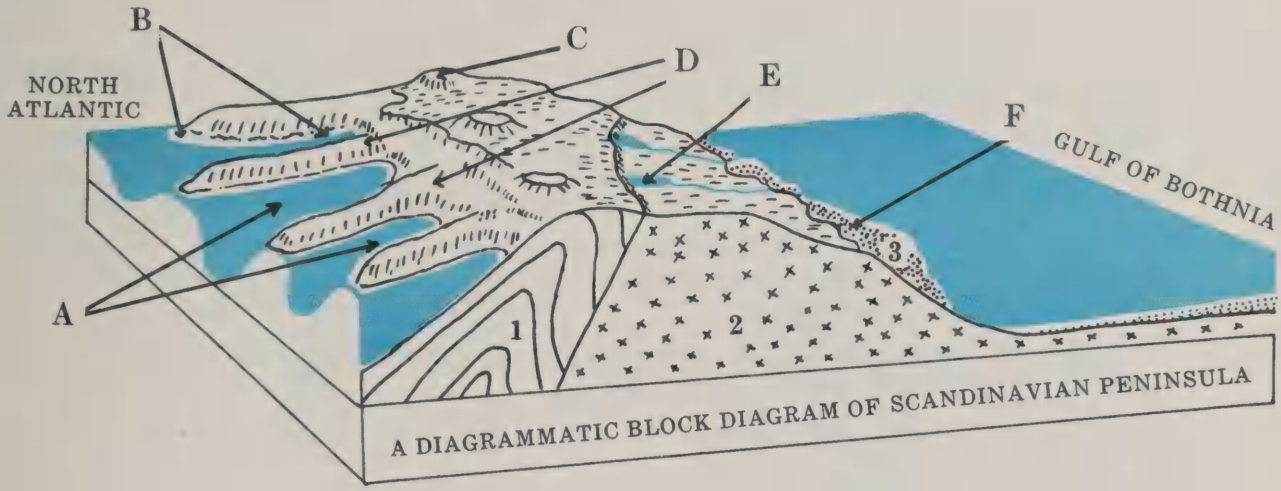
> "I entered Szechwan from the north in September *by the new railway,* at night. I awoke as the train was rolling down from the mountains along the bank of a deep river, all morning in and out of tunnels above *the cocoa-coloured water.* It was incomparable country, like nothing I had seen before. Pagodas and towers sat on mountain tops, familiar from old landscapes, and *men sweated on the tow path, hauling sampans upstream.*
>
> Imperceptibly the tunnels became further apart as the railway slipped into the great rice bowl of Szechwan, and the morning slipped into afternoon. *The rice bowl*! The harvest was in swing. Stooks stood in little fields and villagers threshed, beating sheaves of gold into matting bins. In the evening I was still on the train, and *buffaloes were ploughing the stubble-fields,* turning the chocolate soil over with tremendous satisfaction. They looked pleased with their work, those buffaloes. However, there are less happy things to look at, and if the buffaloes out in the countryside had looked content, the same could not be said of the men and women working along the *Chungking waterfront.*

"A Visit to Chungking" by N. Wollaston, *The Geographic Magazine, 1963.*

8 (*b*) The climatic data below is representative of *two* different stations in the Yangtze River basin.

Station	Average Temperature In Degrees Fahrenheit		Total Precipitation During The 3 Winter Months Of December, January, February
	Jan.	July	
A	37.9	80.2	5.6″
B	48.6	82.4	2.3″

(i) Account for the differences in climate which are reflected in the statistics.
(ii) In what part of the river basin is each station located?



5 6. (*a*) With reference to the block diagram sketch above, identify *ONLY* the physical features labelled by the capital letters A, B, C, D, and E.

3 (*b*) Identify the underlying structure labelled 1, 2 and 3.

5 (*c*) With the aid of neatly labelled simple sketches show how feature A has been formed.

7 (*d*) Show how the land use at D *and* the area between E and F are related to the physical environment.

12 7. (*a*) Describe, giving specific examples, the methods which India has used in the past fifteen years to increase agricultural production.

8 (*b*) Why has the increase in its agricultural production failed to keep pace with the increase in population? Discuss fully.

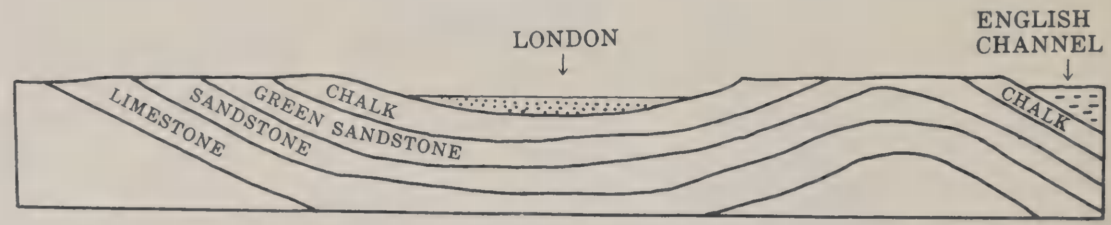
5 8. (*a*) Draw a large sketch map of the Ukraine. On it indicate and label the various sources of power in the region.

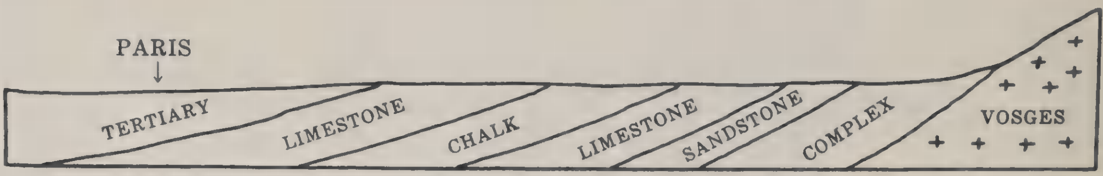
8 (*b*) For *each type* of power resource discuss
(i) its relative importance within the U.S.S.R.
(ii) the degree to which it must be supplemented by sources outside the Ukraine.

7 (*c*) How have the Ukraine's power resources contributed to the development of *ONE* of its industrial subregions?

CONTINUED OVER→

9. Choose *either* London *or* Paris in answering all parts of this question.





(*a*) The two diagrams above represent geological cross-sections of the London and Paris Basins as they might have appeared seventy million years ago.

3 (i) Draw a cross-section to show how the Basin you have chosen might appear today.

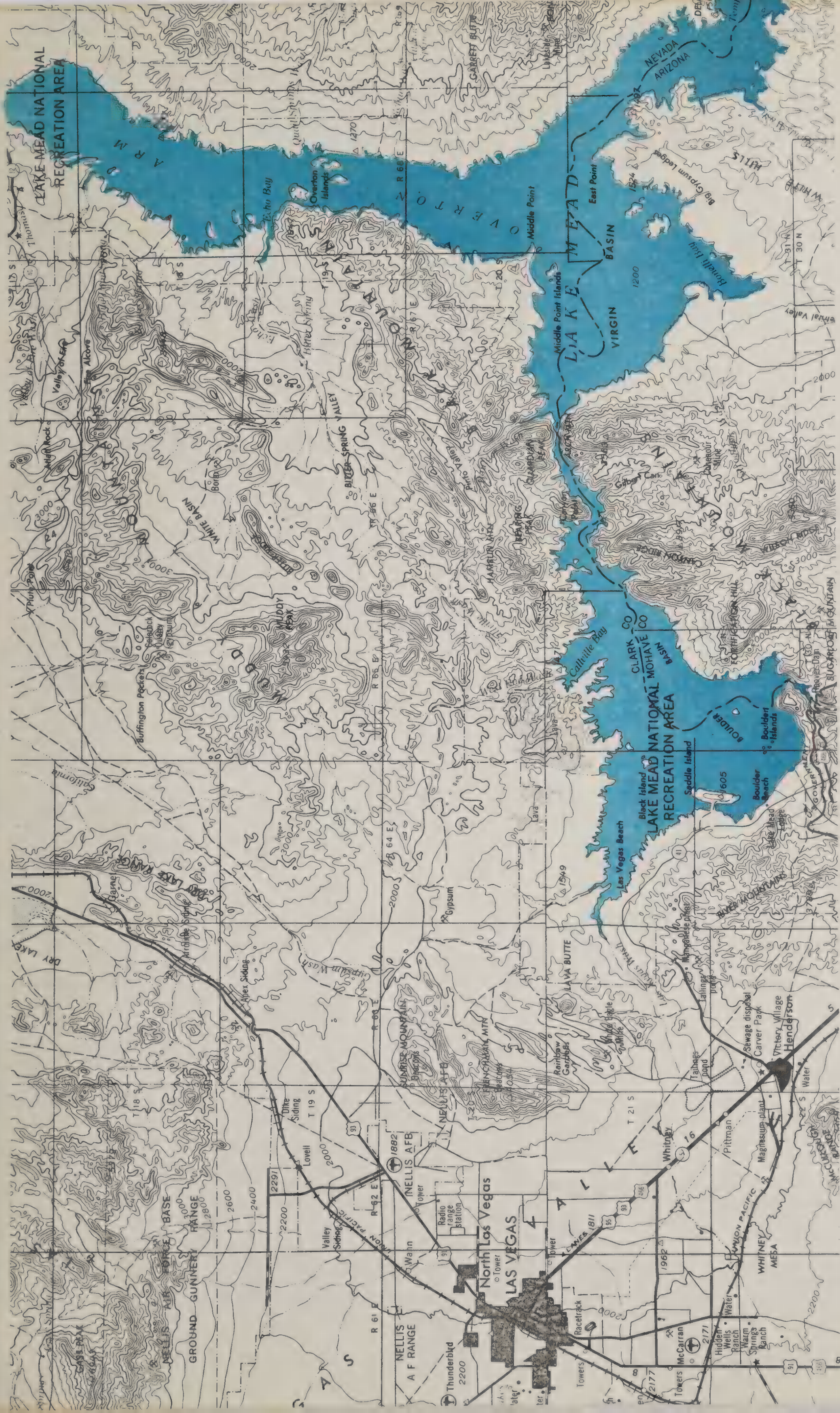
2 (ii) Label by name *four* physical features which you have indicated on your cross-section.

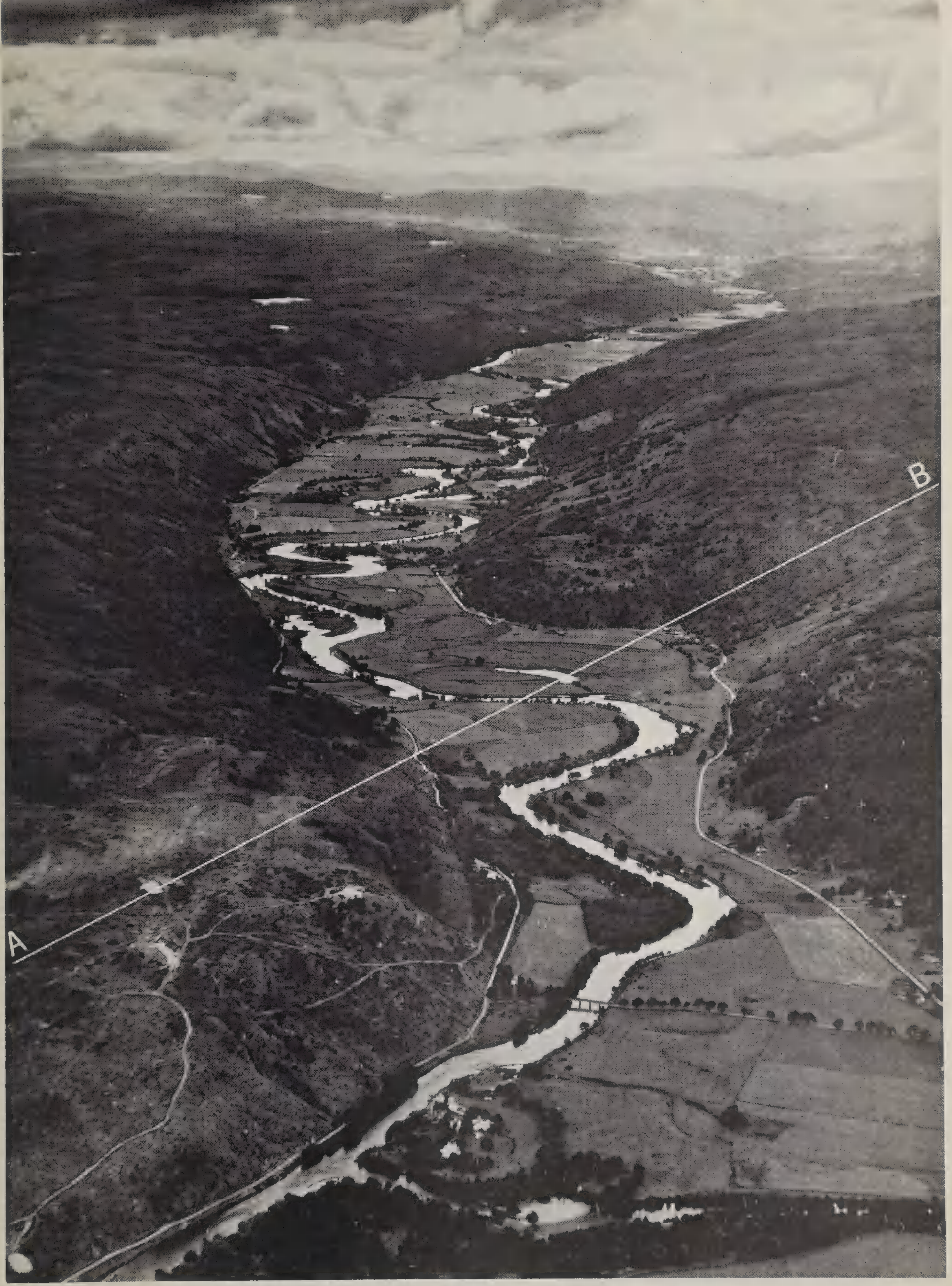
2 (iii) Describe briefly the process which has produced the features indicated in (ii).

5 (*b*) Draw a sketch map to show the site (local setting) of the city of *either* London *or* Paris. Locate by shading carefully and labelling;

(i) the main docking areas,
(ii) the location of the principal government buildings,
(iii) the commercial core of the city.

8 (*c*) In a written note, account for the growth and present importance of *either* London *or* Paris.


LAKE MEAD NATIONAL RECREATION AREA
OVERTON ARM
LAKE MEAD
VIRGIN BASIN
BOULDER BASIN
NEVADA
ARIZONA
CLARK CO
MOHAVE CO
Overton Islands
Echo Bay
Middle Point
Middle Point Islands
East Point
Callville Bay
Black Island
Saddle Island
Las Vegas Beach
Boulder Beach
Boulder Islands
MUDDY MOUNTAINS
Muddy Peak
Buffington Pockets
WHITE BASIN
BITTER SPRING VALLEY
Valley of Fire
LAVA BUTTE
Gypsum
DRY LAKE
DRY LAKE RANGE
Apex Siding
Dike Siding
Lovell
Valley Siding
NELLIS AFB
NELLIS AIR FORCE BASE GUNNERY RANGE
NELLIS A F RANGE
SUNRISE MOUNTAIN
FRENCHMAN MTN
North Las Vegas
LAS VEGAS
VALLEY
Thunderbird
Racetrack
McCarran
Whitney
Pittman
Magnesium plant
Victory Village
Carver Park
Henderson
WHITNEY MESA
RIVER MOUNTAINS
FORTIFICATION HILL
SUGARLOAF MOUNTAIN
BLACK MOUNTAINS
UNION PACIFIC


B
A

DEPARTMENT OF EDUCATION, ONTARIO

GRADE 12 DEPARTMENTAL EXAMINATIONS, 1966

GÉOGRAPHIE II

EXAMEN DE DEUX HEURES

INSTRUCTIONS:

1. *Inscrivez lisiblement votre nom, votre classe et le nom de votre école sur chacun des livrets d'examen.*

2. *Répondez*:
   - (*a*) *aux deux questions de la partie A,*
   - (*b*) *à une question de la partie B,*
   - (*c*) *à deux questions de la partie C.*

3. *Le surveillant d'examen doit vous remettre une carte topographique ainsi qu'une photographie pour vos réponses aux questions 1 et 2.*

4. *Pour clarifier vos réponses, n'hésitez pas à utiliser croquis ou esquisses (sketch-maps), diagrammes et schémas.*

Valeur approximative

PARTIE A

Répondez aux DEUX questions de la partie A. (Temps approximatif: 22 minutes par question.)

1. Reportez-vous à la carte topographique et répondez aux questions suivantes:

6 (*a*) Décrivez brièvement le relief ainsi que le système d'écoulement des eaux de la région directement au nord du cañon Boulder (Boulder Canyon).

(Le cañon Boulder est la partie étroite reliant les bassins Boulder et Virgin.)

2 (*b*) De quelle région physiographique des Etats-Unis cette carte topographique est-elle tirée?

4 (*c*) Au moyen de faits et d'exemples tirés de la carte topographique, indiquez le type de climat de la région.

6 (*d*) Décrivez, avec preuves à l'appui, *trois* façons par lesquelles le terrain est mis en valeur (land use).

2. Vous reportant à la photographie que l'on vous a remise, répondez aux questions suivantes.

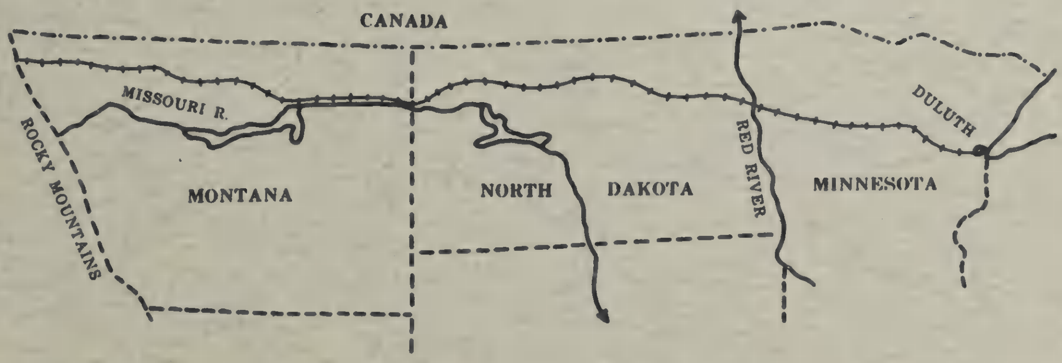
7 (*a*) Esquissez une coupe (cross-section) de la section suivant la ligne AB. Sur votre esquisse, identifiez *cinq* accidents physiographiques (physical features) suivant la même ligne AB.

4 (*b*) Décrivez brièvement l'évolution de l'*un* des accidents physiographiques représentés sur votre esquisse.

6 (*c*) Donnez un aperçu de la mise en valeur *ou* des terres hautes *ou* des terres basses visibles sur la photographie.

PARTIE B

Ne répondez qu'à UNE question de la partie B. Allouez environ 32 minutes.



3. (*a*) L'esquisse (sketch-map) ci-dessus illustre le trajet ferroviaire du Great Northern Pacific. En supposant que vous voyagiez depuis Duluth jusqu'à la frontière occidentale du Montana,

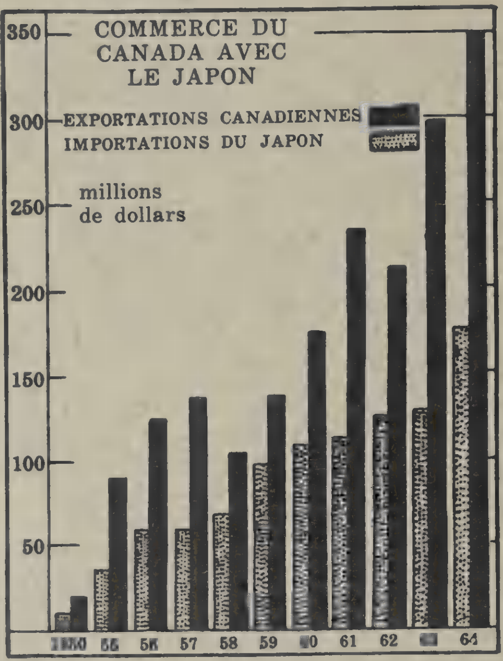
4 (i) énumérez les régions physiographiques que vous traversez,

4 (ii) décrivez le relief de *deux* des régions énumérées dans votre réponse ci-haut à (i),

7 (iii) exposez, avec preuves à l'appui, les variations dans la végétation naturelle telles que vous les observez le long du parcours.

10 (*b*) Mettez en contraste les pratiques de mise en valeur du terrain dans le Montana et dans le Dakota nord, et indiquez comment ces pratiques de mise en valeur caractérisent l'agriculture dans les Grandes Plaines.

TOURNEZ→



Valeur approximative

4 4. (*a*) (i) Le graphique ci-dessus indique-t-il que l'industrie nipponne doit faire face à certains problèmes? Expliquez.

3 (ii) La tendance indiqueé par le graphique semble-t-elle devoir persister durant les dix années à venir? Justifiez votre réponse.

10 (*b*) A l'aide d'une esquisse (sketch-map), donnez un aperçu détaillé de l'épanouissement industriel *ou* de la région Osaka-Kobé (plaine de Kinai) *ou* de la partie septentrionale de Kiou-Siou (Kyushu).

8 (*c*) Au cours de la dernière décade le Japon a triplé sa production manufacturière et s'est classé au troisième rang pour la production mondiale de l'acier. Evaluez l'apport du gouvernement de ce pays à cette poussée industrielle.

PARTIE C

Répondez à DEUX questions de la partie C. Allouez environ 22 minutes pour répondre à chaque question.

12 5. Vous basant sur le texte de la citation suivante, évaluez en deux ou trois phrases concises, la signification géographique de chacune des expressions en italiques.

> "C'est *par le nouveau chemin de fer* au nord, que j'arrive à Setchouan (Szechwan), une nuit de septembre. Je m'éveille au mouvement du train qui dévale des montagnes, en longeant les rives d'une rivière profonde, à travers maints tunnels, au-dessus de cette *masse d'eau chocolat.* C'est un pays incomparable. Tel un apanage des scènes antiques, tours et pagodes empointent les sommets montagneux pendant que des *hommes peinent le long du sentier de halage, à touer les sampans en amont de la rivière.*
>
> Imperceptiblement, les tunnels s'espacent et la voie ferrée s'introduit maintenant dans le grand Bassin Rouge (rice bowl) de Setchouan pendant que le matin fait place à l'après midi. *Le Bassin Rouge*! La récolte bat son plein. Le riz se dresse en meulons dans les petits champs. Les paysans battent les gerbes dorées et la paille s'accumule dans les tasseries. C'est le soir et je suis toujours dans le train. D'un air de contentement profond *les buffles labourent les *chaumes* au sol chocolat. Comme ils semblent se plaire à leur tâche, ces buffles. Des scènes moins plaisantes s'offrent cependant à notre vue. Les bêtes de somme de la campagne chinoise mènent sans doute une existence de tout contentement. Peut-on en dire autant de ces hommes et de ces femmes qui peinent sur les *quais de Tchoungking* (Chunking)?"

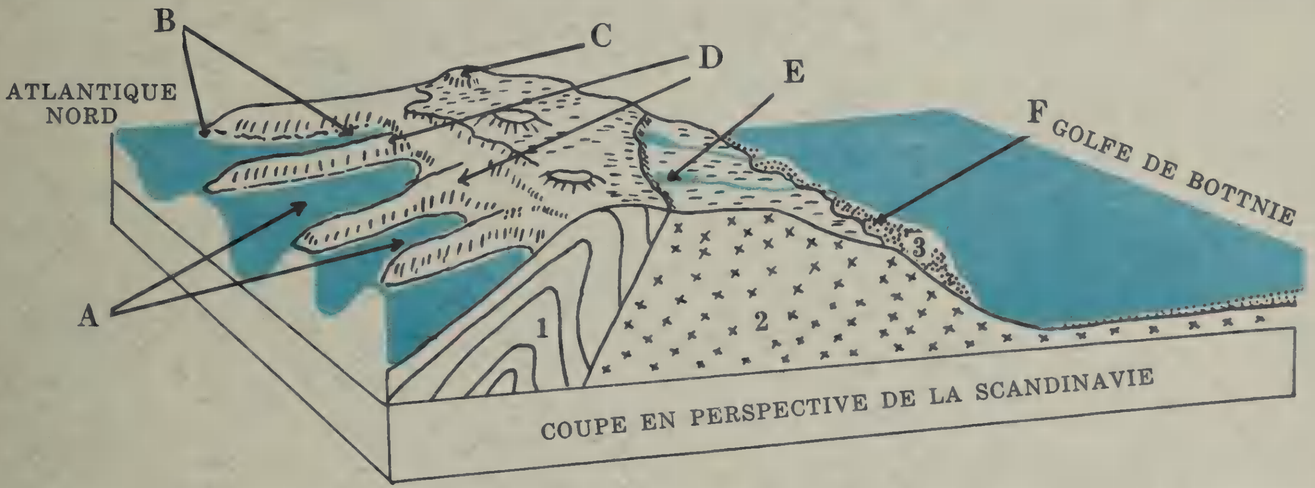
*chaumes — stubble-fields

("Visite à Tchoungking", N. Wollaston, *The Geographic Magazine, 1963.*)

8 (*b*) Les données climatiques suivantes proviennent de *DEUX* stations du bassin du fleuve Yang-tsé.

Station	Température moyenne en degrés Fahrenheit		Précipitation totale des mois d'hiver: décembre, janvier, février
	janv.	juillet	
A	37.9	80.2	5.6″
B	48.6	82.4	2.3″

(i) Expliquez les différences de climat que révèlent ces statistiques.
(ii) Dans quelle partie du bassin chaque station est-elle située?



5 6. (*a*) Identifiez seulement les accidents géographiques indiqués par les lettres A, B, C, D, E sur la coupe en perspective ci-haut.

3 (*b*) Identifiez les infrastructures numérotées 1, 2, 3.

5 (*c*) Au moyen d'esquisses (sketches) simples et clairement étiquetées, indiquez comment l'accident géographique A a été formé.

7 (*d*) Démontrez comment l'utilisation du terrain en D, ainsi qu'entre E et F, est reliée au milieu physiographique.

12 7. (*a*) Vous basant sur des faits précis, indiquez les différentes méthodes par lesquelles l'Inde a pu augmenter sa production agricole au cours des quinze dernières années.

8 (*b*) Pourquoi la producton agricole de ce pays n'a-t-elle pas augmenté au même rythme que son accroissement de population? Expliquez en détail.

5 8. (*a*) Ebauchez une grande carte de l'Ukraine sur laquelle vous devrez indiquer et identifier les diverses ressources d'énergie de cette region.

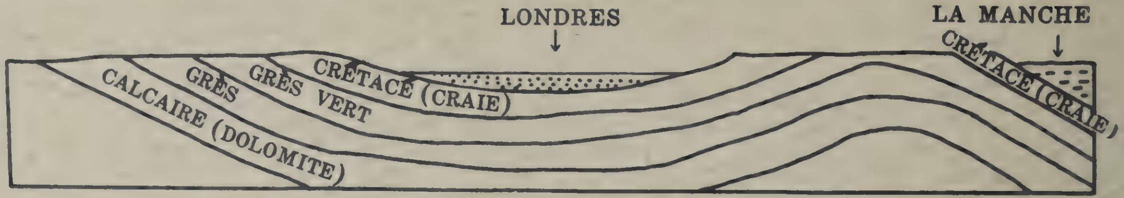
8 (*b*) Pour *chaque espèce* de ressource d'énergie, démontrez
  (i) son importance relative dans l'U.R.R.S.,
  (ii) jusqu'à quel point l'Ukraine doit importer l'énergie pour suffire à ses besoins.

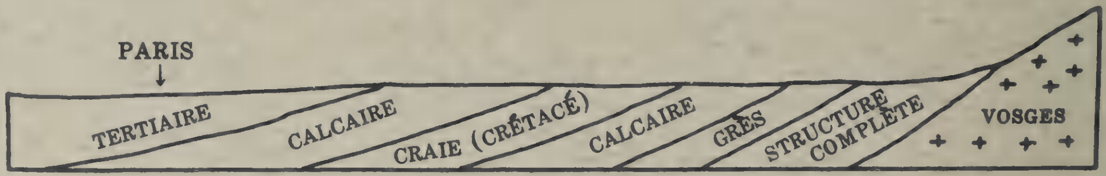
7 (*c*) Comment les ressources naturelles d'énergie de l'Ukraine ont-elles contribué au développement de l'*une* de ses sous-régions industrielles?

TOURNEZ →

Valeur approximative

9. Choisissez *ou* Londres *ou* Paris pour répondre à toute cette question.





(*a*) Les deux coupes géologiques ci-dessus sont celles des bassins de Londres et de Paris tels qu'ils étaient il y a soixante-dix millions d'années.

3 (i) Faites un croquis pour montrer l'aspect actuel de celui des deux bassins que vous avez choisi pour répondre à cette question.

2 (ii) Identifiez correctement *quatre* des accidents géographiques que vous avez inclus dans votre croquis.

2 (iii) Décrivez brièvement le procédé de formation et d'évolution des faits physiographiques identifiés en (ii) ci-dessus.

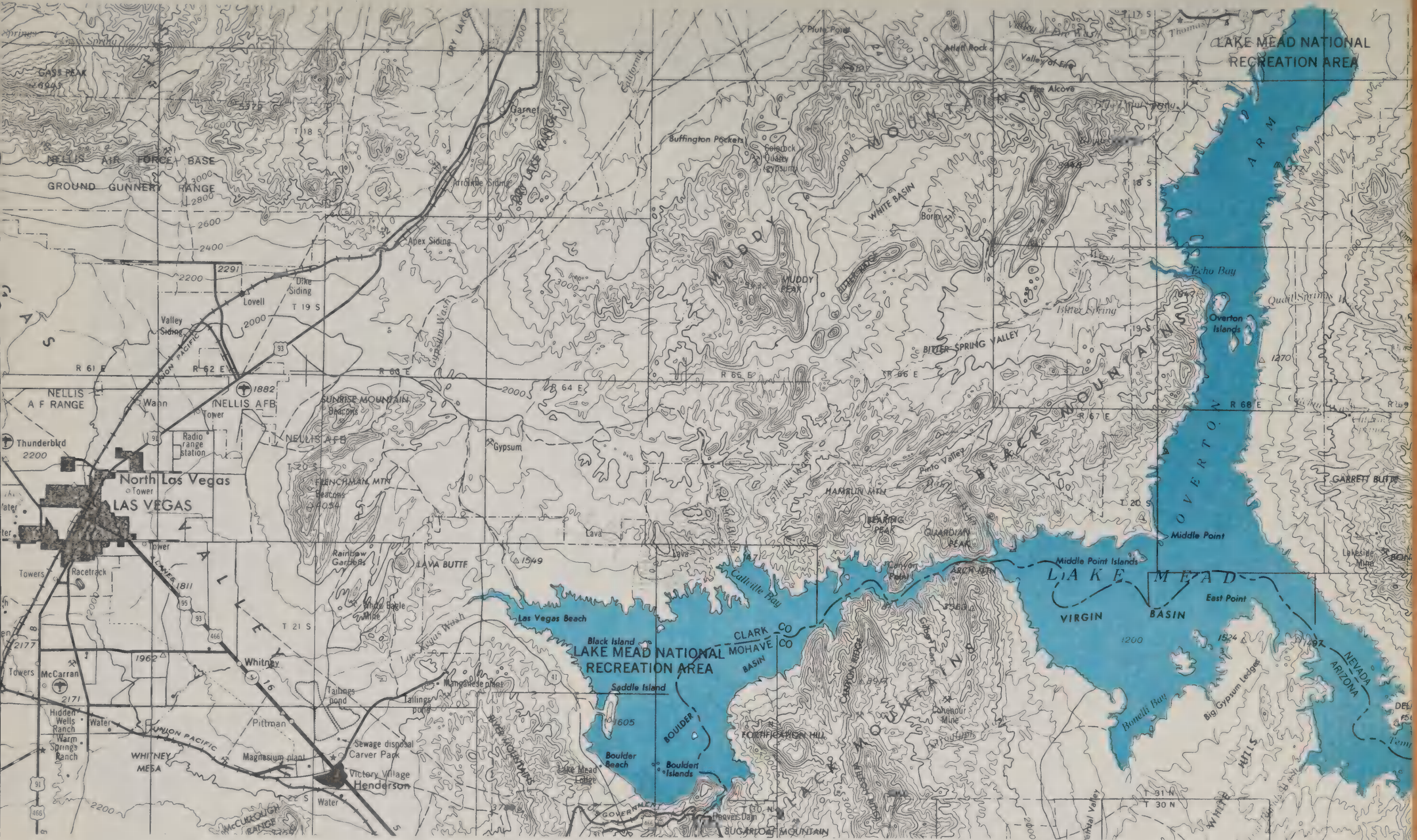
5 (*b*) Esquissez une carte du site *ou* de Londres *ou* de Paris. Au moyen d'une légende, situez et identifiez

(i) les principales installations portuaires,

(ii) les principaux édifices du gouvernement,

(iii) le centre commercial de la ville.

8 (*c*) Rédigez un exposé du développement ainsi que de l'importance actuelle *ou* de Londres *ou* de Paris.


LAKE MEAD NATIONAL RECREATION AREA
GASS PEAK
NELLIS AIR FORCE BASE
GROUND GUNNERY RANGE
NELLIS A F RANGE
Thunderbird
North Las Vegas
LAS VEGAS
Tower
Towers
Racetrack
McCarran
Hidden Wells Ranch
Warm Springs Ranch
Water
WHITNEY MESA
Wann
Valley Siding
Lovell
Dike Siding
NELLIS AFB
Radio range station
Apex Siding
Arrolime Siding
Garnet
DRY LAKE RANGE
DRY LAKE
SUNRISE MOUNTAIN
Beacons
FRENCHMAN MTN
Rainbow Gardens
LAVA BUTTE
Lava
Gypsum
Gypsum Wash
White Eagle Mine
Whitney
Pittman
Magnesium plant
Sewage disposal
Carver Park
Victory Village
Henderson
Tailings pond
Manganese plant
Las Vegas Wash
RIVER MOUNTAINS
Lake Mead Lodge
McCULLOUGH RANGE
VALLEY
Buffington Pockets
Bitter Spring
BITTER SPRING VALLEY
WHITE BASIN
Borax
MUDDY PEAK
MUDDY MOUNTAINS
Pluto Point
Atlatl Rock
Valley of Fire
Fire Alcove
St Thomas
Echo Bay
Echo Wash
Overton Islands
OVERTON ARM
Quail Springs
GARRETT BUTTE
Lakeside Mine
Middle Point
Middle Point Islands
LAKE MEAD
VIRGIN BASIN
East Point
Big Gypsum Ledges
Bonelli Bay
NEVADA
ARIZONA
WHITE HILLS
BLACK MOUNTAINS
Pinto Valley
HAMBLIN MTN
BEARING PEAK
GUARDIAN PEAK
Callville Bay
Callville Wash
Las Vegas Beach
Black Island
CLARK CO
MOHAVE CO
BOULDER BASIN
Saddle Island
Boulder Beach
Boulder Islands
FORTIFICATION HILL
Hoover Dam
SUGARLOAF MOUNTAIN
BLACK MOUNTAINS
Cohenour Mine
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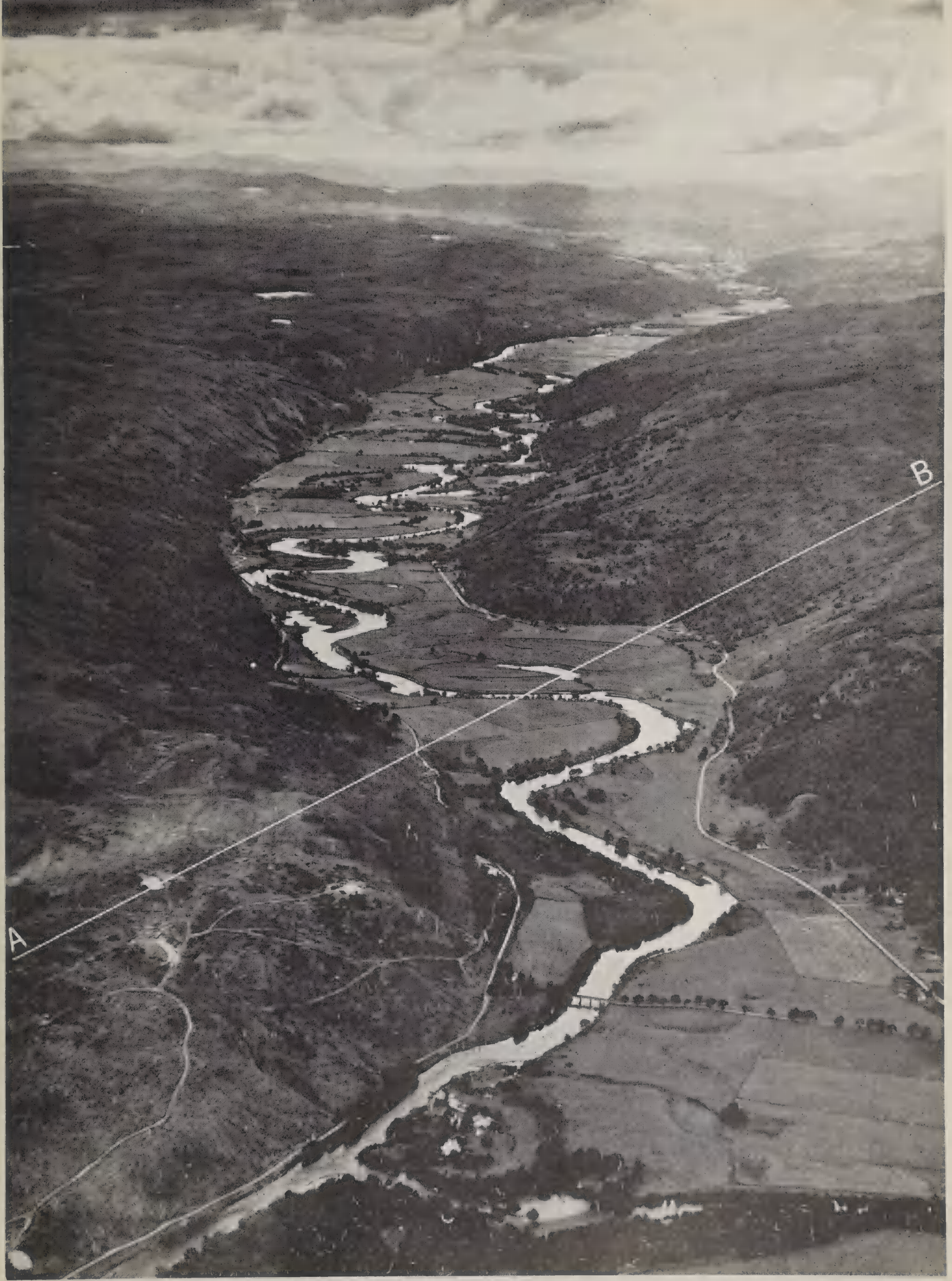
16
UNION PACIFIC
LAKES


A
B

DEPARTMENT OF EDUCATION, ONTARIO

GRADE 12 DEPARTMENTAL EXAMINATIONS, 1966

APPLIED ELECTRICITY

TIME — $2\frac{1}{2}$ HOURS

NOTE 1. *The Presiding Officer will provide you with Part A (which includes diagram sheets to be used in answering Questions 3 and 5), and Part B at the beginning of the examination period.*

NOTE 2. *Your name and form, and the name of your school, are to be written clearly at the top of Part B, on the diagram sheets, and on each examination book.*

NOTE 3. *You should obtain a set of mathematical tables from the Presiding Officer.*

Values

PART A

9 1. The high-voltage windings of a three-phase transformer are star-connected. The low-voltage windings are delta-connected. The turns ratio between the high-voltage and the low-voltage windings is 10:1. The transformer is supplied by a three-phase, four-wire system whose line voltage is 4156.8 volts. The secondary supplies energy to a three-phase, industrial motor load of 60 amperes per line wire.

Determine

(*a*) the secondary line voltage,
(*b*) the kva. output of the transformer,
(*c*) the primary line current.

Assume the exciting current to be negligible.

8 2. (*a*) An unloaded, squirrel-cage, polyphase induction motor has a low power factor. State the reason for this.

(*b*) Why does the power factor of a squirrel-cage induction motor improve as the load is increased from zero to rated load?

12 3. Use the accompanying Bill of Material form to list the materials for an overhead consumer's service rated at 100 amperes, 550 volts, three phase, 60 cycles. Include the materials required from the point of connection to the conductors of the supply authority, to and including the consumer's splitter trough. Give all the necessary information as indicated by the column headings. Do not state lengths of conductors or conduit.

10 4. A parallel circuit, consisting of two branches, is supplied from a 120-volt, 60-cycle, a-c source. Branch Number 1 contains a 40-ohm, non-inductive resistor. Branch Number 2 contains a coil of 10 ohms impedance. The circuit power is 1224 watts.

Determine

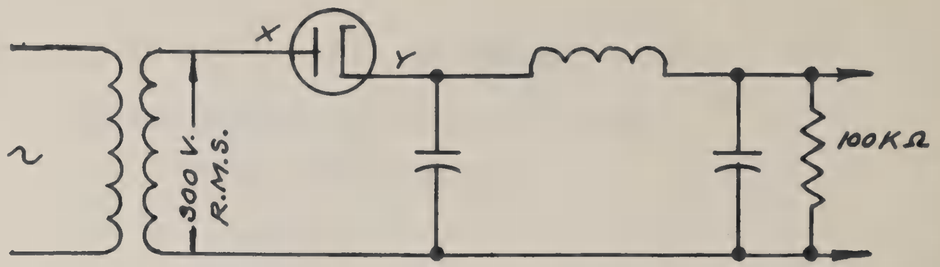
(i) the current in branch Number 1,
(ii) the current in branch Number 2,
(iii) the power for branch Number 1,
(iv) the power factor of branch Number 2,
(v) the phase angle of branch Number 2,
(vi) the phase angle of the entire circuit,
(vii) the power factor of the entire circuit,
(viii) the current supplied to the parallel circuit.

10 5. Complete the accompanying diagram of a magnetic "across-the-line" starter controlling a three-phase, squirrel-cage induction motor. The two stop-start stations, and the one stop-jog station are to be connected in the circuit at the locations shown.

CONTINUED OVER →

Values

5 6.



The diagram above shows the circuit of a half-wave rectifier with a capacitive-input filter.

- (i) Assuming that there are no losses, what maximum voltage would appear across the diode?
- (ii) State the polarity at point X, in relation to point Y, when this maximum voltage appears.
- (iii) State the name given to this maximum voltage.

6 7. A motor circuit supplies a 7½-hp., 220-volt, three-phase, squirrel-cage induction motor. The motor's nameplate current is 23 amperes.

State

- (*a*) the current rating of the switch,
- (*b*) the current rating of the fuses,
- (*c*) the size of the conductors with type TW insulation,
- (*d*) the size of the rigid conduit,
- (*e*) the rating of the overload relays.

Answer *either* question 8 or 9 but not both

6 8. Three loads, each having a resistance of 16 ohms and an inductive reactance of 12 ohms, are delta-connected to a 220-volt, three-phase supply.

Find

- (*a*) the impedance per phase,
- (*b*) the current per phase,
- (*c*) the three-phase power.

OR

6 9. A six-pole, three-phase, 60-cycle, squirrel-cage induction motor has a full-load speed of 1140 rpm.

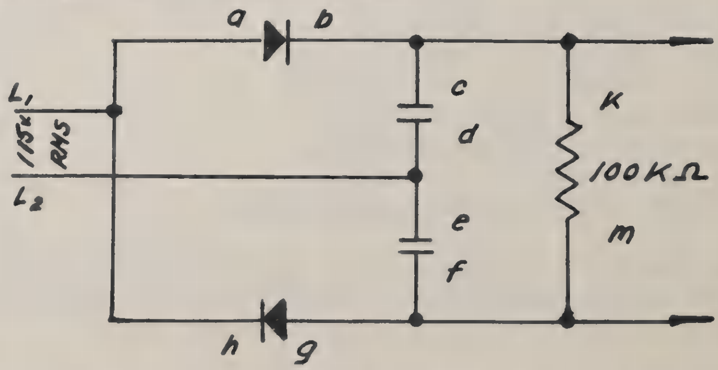
Determine

- (*a*) the synchronous speed,
- (*b*) the slip,
- (*c*) the per cent slip,
- (*d*) the rotor frequency.

8 10. (*a*) Draw the circuit diagram of two single-phase wattmeters, three ammeters, and three voltmeters connected for measuring the power, line voltage, and line current supplied to a balanced, delta-connected, three-phase load. Show polarity marks where necessary.

(*b*) One of the wattmeters indicates zero and the other indicates 1200 watts. What is the total power, and the power factor of the load?

6 11.



Explain the operation of the voltage doubler circuit shown above. (*a*) when L_1 is negative, and (*b*) when L_2 is negative. (*c*) What will be the approximate voltage between k and m? Which end of resistor km will be positive?

DEPARTMENT OF EDUCATION, ONTARIO

GRADE 12 DEPARTMENTAL EXAMINATIONS, 1966

APPLIED ELECTRICITY

PART B

NAME ....

FORM ....

NAME OF SCHOOL ....

NOTE 1. *Part B is to be inserted in your examination book before it is handed in at the end of the examination period.*

NOTE 2. *Part B has a total value of 20 marks. All items are equal in value.*

There are four suggestions for answering or completing each of the following questions or incomplete statements. Select the correct response, and circle its *letter* in the answer column at the right.

1. An ammeter may be made from a D'Arsonval galvanometer by connecting it
- (A) across the terminals of the load
- (B) in series with a low resistance shunt
- (C) in parallel with a low resistance shunt
- (D) in series with a shorting switch

1. A B C D

2. According to Table 5 of the 1963, H.E.P.C. Ontario Electrical Code, the maximum number of #10 AWG conductors with TW insulation that may be placed in a ¾-inch conduit is

(A) 2 (B) 3 (C) 4 (D) 5

2. A B C D

3. An electrical instrument that can be damaged by excessive current even when its needle is deflecting less than full scale is
- (A) a wattmeter
- (B) an ohmmeter
- (C) a voltmeter
- (D) an ammeter

3. A B C D

4. A single-phase autotransformer supplies current at 200 volts to a load of pure resistance. The input to the transformer is 20 amperes at 500 volts. The winding currents are
- (A) 50 and 70 amperes
- (B) 20 and 50 amperes
- (C) 20 and 30 amperes
- (D) 20 and 70 amperes

4. A B C D

5. A high-resistance, squirrel-cage, rotor winding may be found in
- (A) wound-rotor motors
- (B) interpole motors
- (C) high torque motors
- (D) universal motors

5. A B C D

6. To reverse the direction of rotation of a capacitor-start, induction-run, single-phase motor
- (A) interchange the line conductors
- (B) reverse the capacitor leads
- (C) reverse the starting winding leads
- (D) reverse both starting and running connections

6. A B C D

7. A series circuit containing resistance, inductance and capacitance is connected to an a-c supply whose frequency is variable. When the frequency is made higher than the resonant frequency the circuit is

(A) inductive (B) capacitive (C) resistive (D) synchronous

7. A B C D

8. In checking the insulation resistance of the windings of a motor or a generator one would normally employ
- (A) a Wheatstone bridge
- (B) a Megger
- (C) a voltmeter and an ammeter
- (D) an impedance bridge

8. A B C D

CONTINUED OVER⟶

9. The usual reason for connecting a capacitor in parallel with a single-phase induction motor is to

(A) raise the circuit power factor
(B) assist in starting the motor
(C) increase the line current
(D) reduce the in-phase current

9. A B C D

10. A capacitor-start, induction-run, single-phase motor is used in preference to a split-phase, resistance-start, single-phase motor to

(A) improve the power factor
(B) provide improved starting torque
(C) reduce television interference
(D) reduce arcing at the contacts

10. A B C D

11. If the maximum value of a sine-wave alternating current is 20.0 amperes, the effective value is

(A) 12.74 amperes
(B) 7.07 amperes
(C) 22.2 amperes
(D) 14.14 amperes

11. A B C D

12. A voltmeter suitable for general purpose industrial testing on low-potential and extra-low-potential circuits is likely to have a deflection sensitivity of

(A) 5 amperes
(B) 1.5 amperes
(C) 0.5 ampere
(D) 0.005 ampere

12. A B C D

13. An instrument potential transformer has

(A) relatively few primary turns
(B) a high ratio of primary to secondary turns
(C) a built-in secondary shorting switch
(D) a high secondary current rating

13. A B C D

14. A tetrode vacuum tube does not have

(A) an anode (or plate)
(B) a suppressor grid
(C) a screen grid
(D) a control grid

14. A B C D

15. To reverse the direction of rotation of a shaded-pole motor

(A) reverse the line wires
(B) reverse the shading coil
(C) reverse the running winding
(D) reverse the stator core

15. A B C D

16. When three-phase synchronous motors are started

(A) the d-c field terminals should be shunted by a low resistance
(B) the centrifugal switch should be closed
(C) the d-c field should have normal excitation
(D) the d-c field terminals should be open-circuited

16. A B C D

17. A star-delta starter would be used in preference to a magnetic full-voltage starter when

(A) the feeder's current-carrying capacity is limited
(B) the load requires high starting torque
(C) speed control is required
(D) the supply is 120/208 volts a-c

17. A B C D

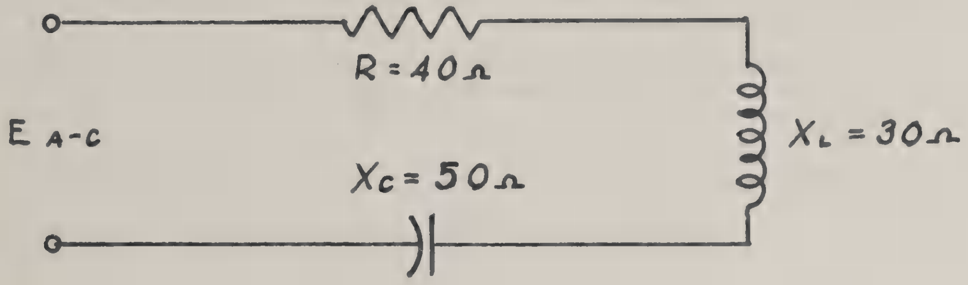
18. Synchronous condensers are used to

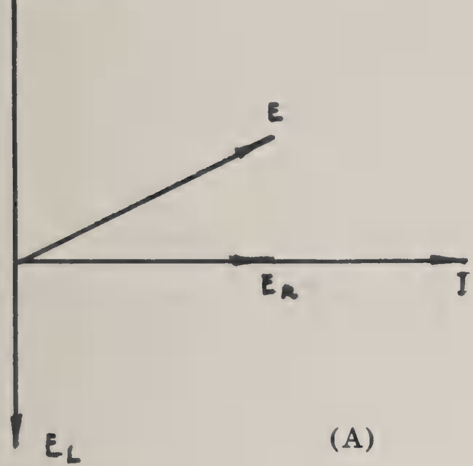
(A) drive heavy loads at constant speed
(B) operate timing mechanisms
(C) counteract large leading currents
(D) raise transmission-line power factor

18. A B C D

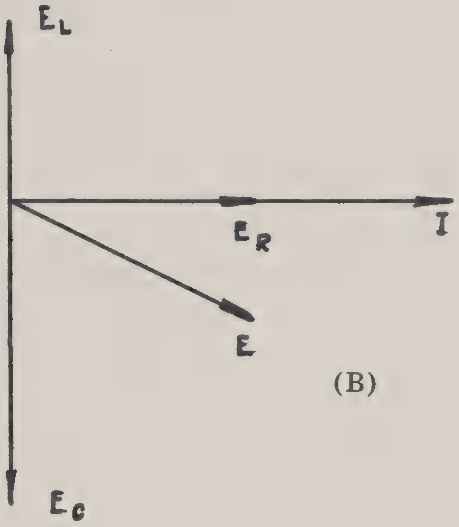
19. Which one of the following vector diagrams is correct for the circuit shown?

19.
A B C D

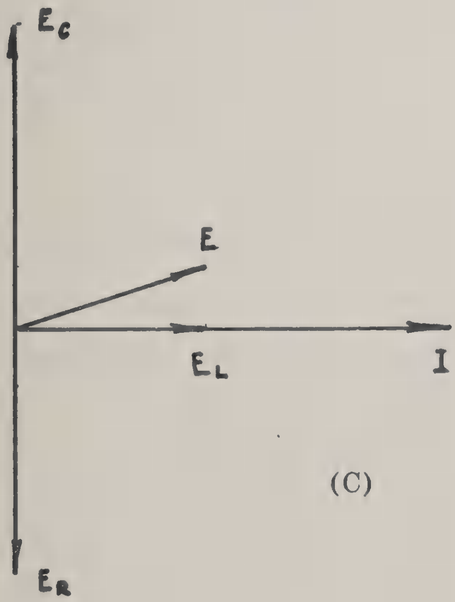




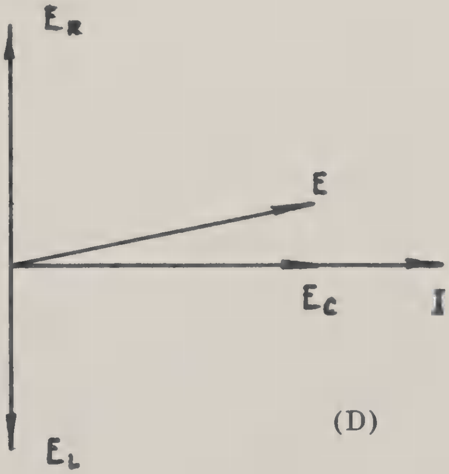
(A)



(B)



(C)

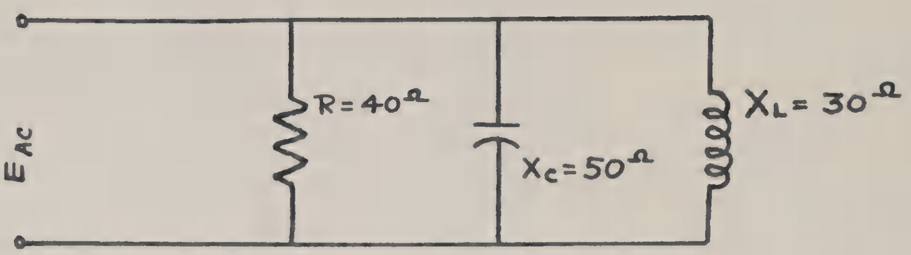


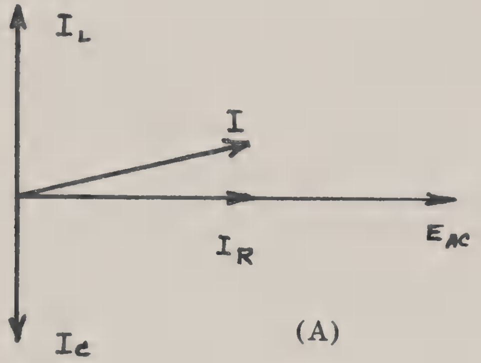
(D)

CONTINUED OVER→

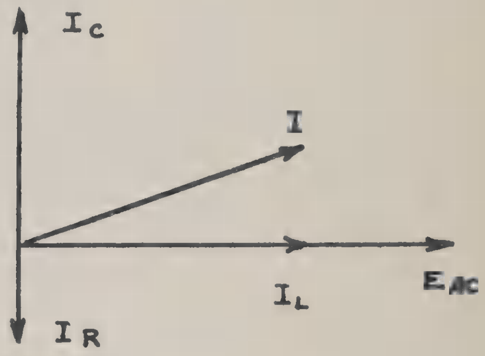
20. Which one of the following vector diagrams is correct for the circuit shown?

20.
A B C D

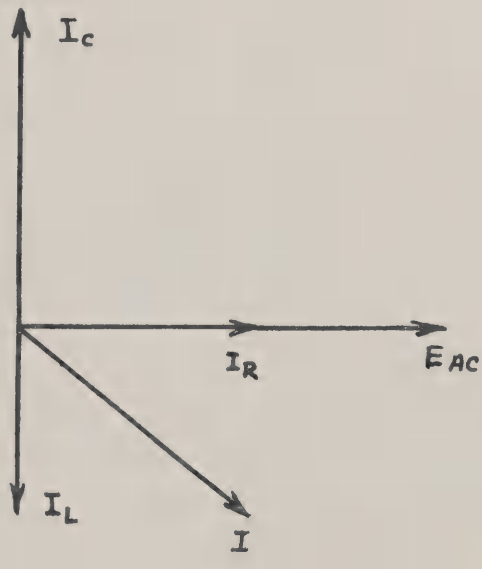




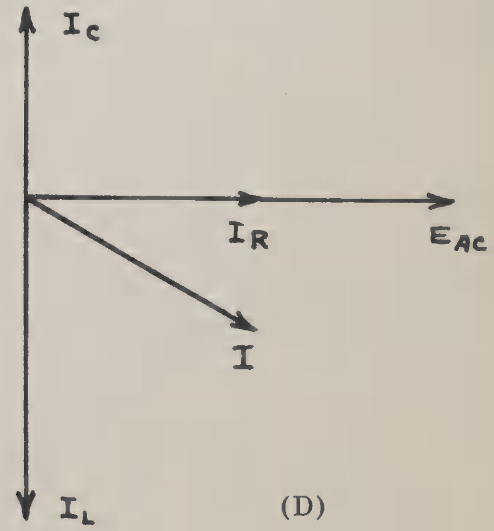
(A)



(B)



(C)



(D)

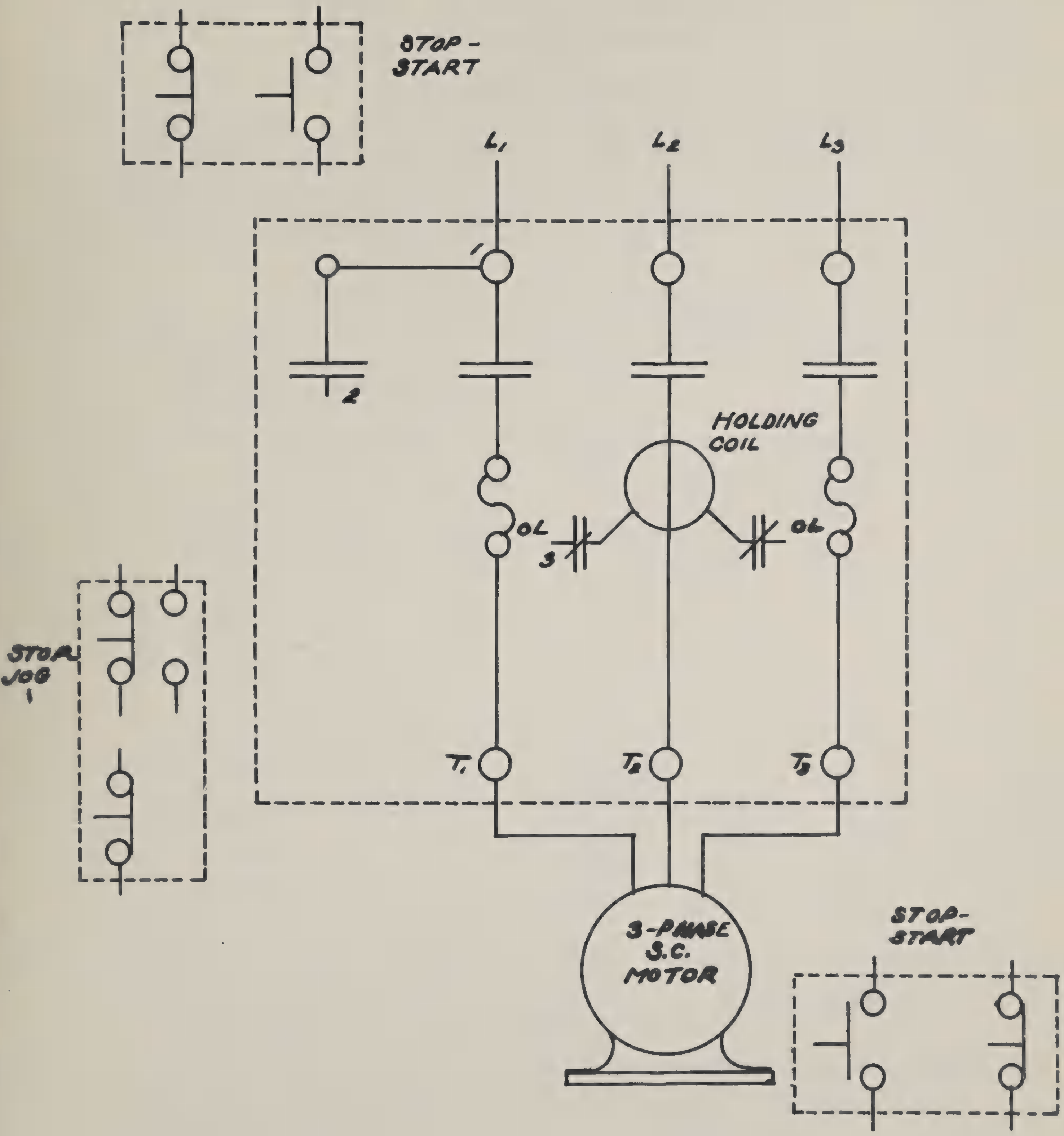
To be used in answering Question 3.

BILL OF MATERIAL

Qty.	Item	Size, Rating	Type, Material, Description

NAME................................ FORM.......... SCHOOL.......................

To be used in answering Question 5.



NAME.................................... FORM............ SCHOOL.................................

DEPARTMENT OF EDUCATION, ONTARIO

GRADE 12 DEPARTMENTAL EXAMINATIONS, 1966

APPLIED ELECTRONICS

TIME — 2½ HOURS

NOTE 1. *The Presiding Officer will provide you with Part A (which includes diagram sheets to be used in answering Questions 3, 9, 12 and 13), and Part B, at the beginning of the examination period.*
NOTE 2. *You are advised to allow approximately 30 minutes for Part B.*
NOTE 3. *Your name and form, and the name of your school, are to be written clearly at the top of Part B, on the diagram sheets, and on each examination book.*

Values

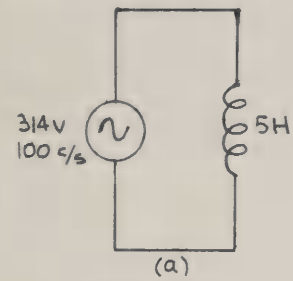
PART A

SECTION I—Answer *all* questions in this section.

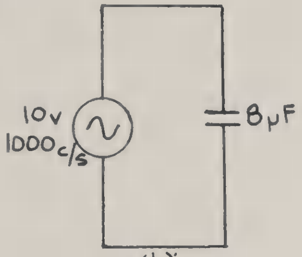
1. A microammeter has a full-scale deflection of 100 microamperes and an internal resistance of 900 ohms. Draw a ciruit diagram and calculate the electrical value of the additional components required in order to convert this meter to measure

2 (*a*) current to 1 milliampere (full-scale)
2 (*b*) voltage to 250 volts (full-scale).

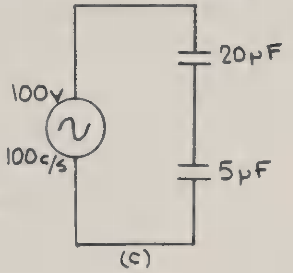
5 2. Calculate the current supplied by the source in any *five* of the following circuits.



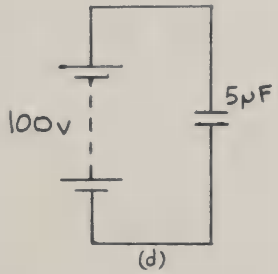
(a)



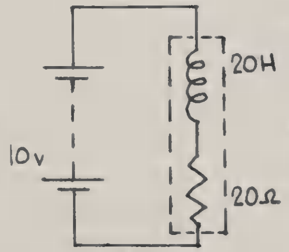
(b)



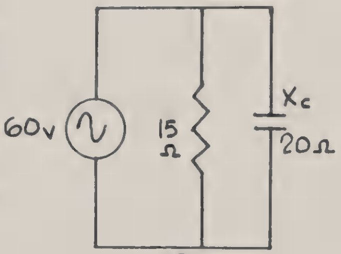
(c)



(d)



(e)



(f)

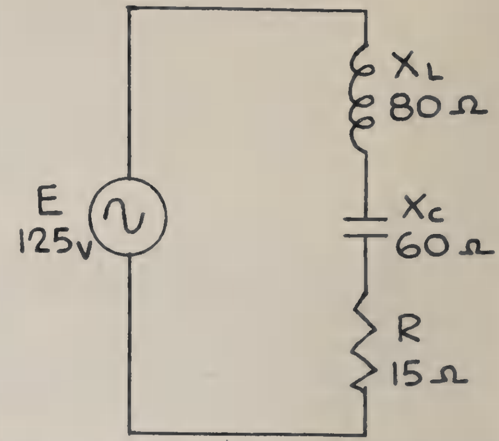
3. Refer to the circuit diagram of the 14 watt amplifier when answering the following questions.

1 (*a*) What kind of power supply circuit is used in this amplifier?
1 (*b*) What is the purpose of the network consisting of R21, and the dual capacitor C1?
1 (*c*) What is the purpose of the 210 Ω resistor R16?
1 (*d*) What is the minimum power rating for R16?
3 (*e*) *Three* different methods of signal coupling are used in this amplifier circuit. Name, and describe the circuit location of each of the *three* coupling methods.
1 (*f*) Why is the network consisting of C5, and R10, included in this amplifier circuit?
1 (*g*) Explain why R12 and R13 must have equal resistances.
1 (*h*) In a balanced output system, as used in this amplifier circuit, degeneration is cancelled by the circuit action of R16. Since this is the case, state the reason for including the 50-μf capacitor C1 in this circuit.
1 (*i*) What would be the effect on the high frequency response of the amplifier, if R4 became open circuited?
1 (*j*) Which component would have failed, if "motorboating" became a problem with this amplifier?

CONTINUED OVER⟶

Values

4. An inductance, a capacitance, and a resistance are connected to a source of alternating voltage as shown.



Answer the following in the order most convenient for you.

2 (*a*) Draw the vector diagram (phasor diagram) approximately to scale. All voltages and currents in the circuit should be represented.

1 (*b*) Calculate the voltage across the inductance.

1 (*c*) Calculate the voltage across the capacitance.

1 (*d*) Calculate the voltage across the resistance.

1 (*e*) Calculate the current supplied by the source.

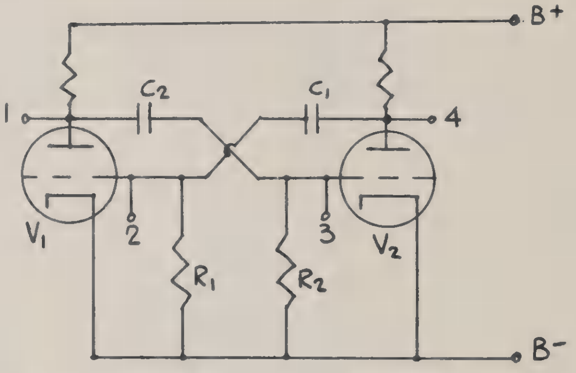
1 (*f*) Calculate the circuit impedance.

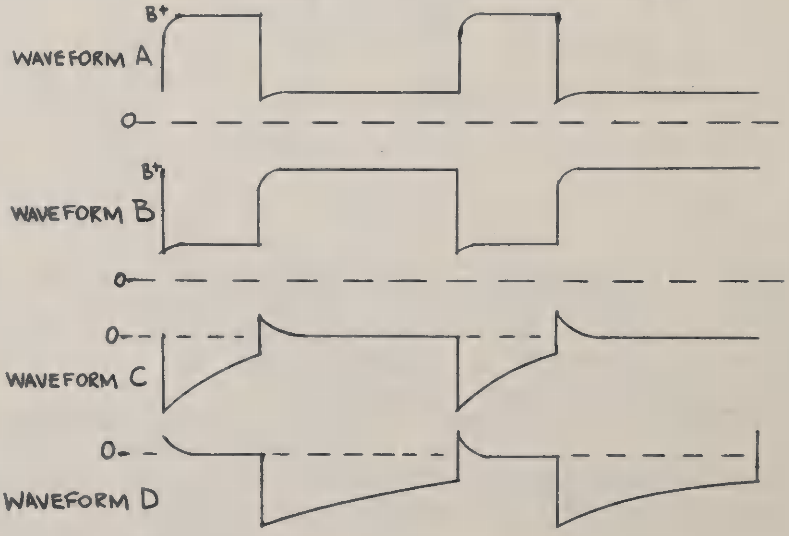
4 5. A power amplifier requires a 4500 Ω load impedance for best overall performance. Calculate the turns ratio of the impedance matching transformer that will properly couple this amplifier to a 500 Ω transmission line.

5 6. Name *one* practical application, or use, for any *five* of the following devices.

(*a*) Phototube
(*b*) Thyratron
(*c*) Saturable core reactor
(*d*) Silicon controlled rectifier
(*e*) Strobotron
(*f*) Ignitron
(*g*) Zener diode

7.





1 (*a*) Identify by name the circuit shown above.

1 (*b*) It is required to have assymetrical operation with the second tube (V_2) cut off for twice as long as the first tube (V_1). How can this be arranged?

4 (*c*) The circuit produces the four waveforms shown when operating as stated in 7(*b*). State which waveform will be present at each of the terminals 1, 2, 3, 4, on the circuit diagram.

Values

8. Describe a method by which an oscilloscope could be used to determine the frequency of an audio-frequency oscillator which develops a sine wave. Use the following points as a guide for your answer.

2 (*a*) To which terminals of the oscilloscope would you connect the oscillator under test?

2 (*b*) Is any auxiliary equipment required? If so, why is it required, and how is it utilized?

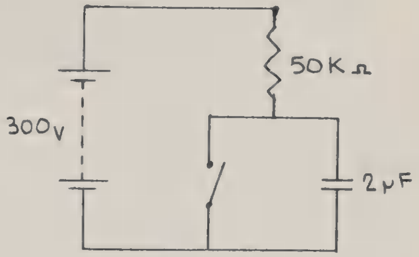
2 (*c*) Describe, or sketch the oscilloscope display from which the frequency of the oscillator is determined.

2 (*d*) Explain how the oscilloscope display is interpreted.

2 (*e*) What factor will affect the accuracy of this method of frequency determination?

4 9. Refer to the universal time-constant graph on the sheet provided, when answering this question.

In the circuit shown, the capacitor is first discharged by closing the switch. The switch is now opened. How long will it take for the voltage across the capacitor to reach 285 volts after the switch is opened?



SECTION II—Answer *either* question 10 *or* 11 but not both.

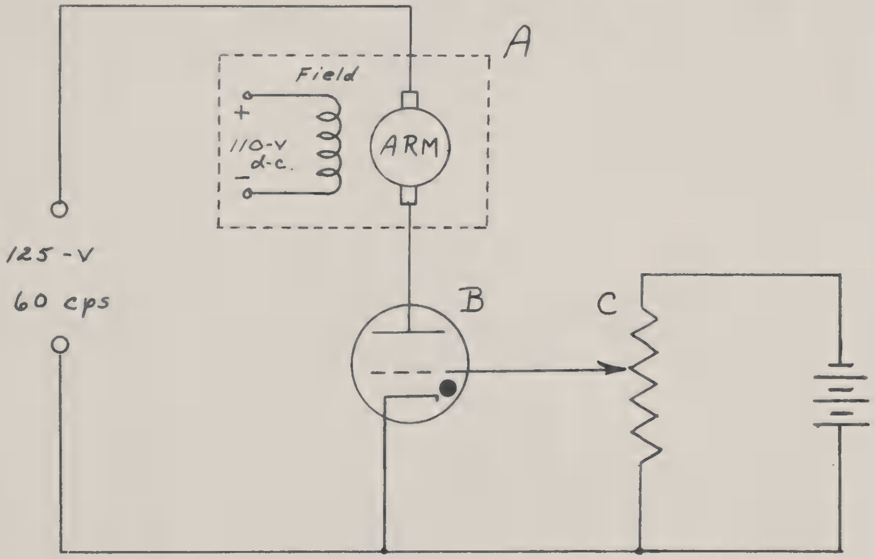
10. Refer to the diagram below when answering this question.

2 (*a*) What is the purpose of the industrial circuit represented by the diagram?

2 (*b*) Name the component represented by the symbol "B".

2 (*c*) What is the full name of the apparatus enclosed by the dotted line, and labelled "A"?

4 (*d*) What will be the effect on "ARM", if the slider on the variable resistor "C" is moved upwards?



11. Answer *each* of the following questions in one to four lines.

1 (*a*) What was the reason for using an electron gun of the "slashed", or "bent" type, in early television picture tubes?

1 (*b*) Why is it possible to use a straight electron gun in a modern television picture tube?

1 (*c*) For what purpose is an "ion-trap" magnet intended?

2 (*d*) Name *two* methods by which the electron beam in a television picture tube may be focused.

2 (*e*) State *two* advantages gained by "aluminizing" the inner surface of a television picture tube including the screen.

1 (*f*) Picture tubes are frequently classified as 70° tubes, or 90° tubes, or 110° tubes. To what does this method of classification refer?

1 (*g*) With reference to a 21 inch picture tube, to what dimension does the 21 inch measurement apply?

1 (*h*) State *one* reason for having a convex shape for the face of a television picture tube.

CONTINUED OVER→

Values

SECTION III—Answer *either* question 12 *or* 13 but not both.

12. Refer to the transistor common-emitter characteristics graph on the sheet provided when answering this question.

The transistor is used in a common-emitter amplifier circuit under the following conditions: Collector supply voltage (V_{CC}) 12 volts, collector load resistance 1500 ohms, zero signal base bias 75 microamperes, input signal 100 microamperes (peak-to-peak).

2 (*a*) Draw the load line on the graph.

2 (*b*) State the quiescent (zero signal) collector current and collector to emitter voltage.

2 (*c*) Calculate the R.M.S. output voltage.

2 (*d*) From the graph determine the beta (β) of the transistor.

OR

13. Refer to the 12AX7 plate characteristics graph on the sheet provided when answering this question.

A 12AX7 triode is used in an amplifier circuit. The plate supply potential E_{bb}, is 120 volts, and the bias E_C is -0.75 volts in order to hold the quiescent (zero signal) plate current at 0.3 milliamperes.

2 (*a*) Use the plate characteristics for the 12AX7 to determine the load resistance (R_L) required by this amplifier.

2 (*b*) Calculate the resistance of the self-bias resistor (R_K).

2 (*c*) Calculate the voltage amplification of this amplifier. Assume an input signal of 0.5 volts (peak-to-peak), and proper by-passing of R_K.

2 (*d*) Calculate the minimum capacitance necessary to properly by-pass R_K, if the low frequency limit of the amplifier is 100 cycles per second.

DEPARTMENT OF EDUCATION, ONTARIO

GRADE 12 DEPARTMENTAL EXAMINATIONS, 1966

APPLIED ELECTRONICS

PART B

. . . .
NAME

. . . .
FORM

. . . .
NAME OF SCHOOL

NOTE. *The total value of Part B is 25 marks. All items have equal value.*

There are several suggestions for answering or completing each of the following questions or incomplete statements. Select the correct response, and circle its *letter* in the answer column at the right.

1. In a junction diode
   - (A) two junctions are needed
   - (B) heater current is needed
   - (C) two different types of semiconductors are needed
   - (D) three leads are needed

1. A B C D

2. A semiconductor material containing acceptor atoms is called
   - (A) intrinsic
   - (B) P-type
   - (C) N-type
   - (D) A-type

2. A B C D

3. An attenuator
   - (A) amplifies
   - (B) distorts
   - (C) reduces
   - (D) rectifies

3. A B C D

4. The RF component of the detector output is eliminated by the use of a
   - (A) series capacitor
   - (B) shunt capacitor
   - (C) rectifier
   - (D) series resistor

4. A B C D

5. The highest possible d-c output under no-load conditions for a cascade voltage doubler with a 120 v rms input would be
   - (A) 339 volts
   - (B) 240 volts
   - (C) 168 volts
   - (D) 288 volts

5. A B C D

6. A tuned circuit with a high Q will permit a r. f. amplifier to have high
   - (A) fidelity
   - (B) bandpass
   - (C) frequency range
   - (D) selectivity

6. A B C D

7. The majority carriers in semiconductor materials are
   - (A) holes in P-type material
   - (B) holes in N-type material
   - (C) electrons in P-type material
   - (D) acceptor atoms in N-type material

7. A B C D

8. Two voltage amplifier stages in cascade, each having a gain of 30 will require
   - (A) a 100 millivolt input to produce a 30 volt output
   - (B) a 10 millivolt input signal to produce a 9 volt output
   - (C) a 100 millivolt input signal to produce a 6 volt output
   - (D) a 100 millivolt input to the second stage to produce a 6 volt output

8. A B C D

9. In an amplitude modulated system
   - (A) sidebands always accompany the unmodulated carrier
   - (B) sidebands are unnecessary and are eliminated at the transmitter
   - (C) lower sideband frequency plus modulating frequency equals upper sideband frequency
   - (D) upper sideband frequency minus carrier frequency equals modulating frequency

9. A B C D

CONTINUED OVER→

10. A photoconductive cell

(A) does not require an external voltage source
(B) has a higher resistance when illuminated
(C) generates a voltage when not illuminated
(D) has a lower resistance when illuminated

10. A B C D

11. In a frequency modulated system

(A) a stronger modulating signal produces greater deviation
(B) the highest modulating frequency produces the greatest deviation
(C) the rate of deviation depends on the side bands
(D) the rate of deviation is proportional to carrier amplitude

11. A B C D

12. The ampere-turn is the unit of

(A) permeability
(B) reluctance
(C) magnetomotive force
(D) magnetizing force

12. A B C D

13. Surge currents through the diode rectifier in a power supply, are most severe when

(A) no filter is used
(B) a choke input filter is used
(C) a capacitor input filter is used
(D) the load is removed

13. A B C D

14. A receiver is tuned to 710 kc, and its oscillator is operating at 885 kc. The image frequency is

(A) 535 kc
(B) 1060 kc
(C) 1165 kc
(D) 1340 kc

14. A B C D

15. Dielectric heating differs from induction heating because the former

(A) uses eddy currents
(B) requires a hollow work piece
(C) is used to heat poor electrical conductors
(D) only heats the outer surface of the work

15. A B C D

16. Electrolytic capacitors are used for coupling between transistor amplifier stages because

(A) transistors have a higher input impedance than vacuum tubes
(B) a low capacitive reactance is needed
(C) a high leakage resistance is needed
(D) polarity need not be observed

16. A B C D

17. The ripple frequency in the output of a bridge rectifier using four diodes that is operating on a 400-cycle supply is

(A) 200 c.p.s.
(B) 400 c.p.s.
(C) 800 c.p.s.
(D) 1200 c.p.s.

17. A B C D

18. A power transformer having an input of 120 volts and 1 ampere, and delivering 2 amperes to a load of 15 ohms resistance has

(A) no copper loss
(B) an efficiency of 50%
(C) an efficiency of 200%
(D) the secondary voltage and current out of phase by 90°

18. A B C D

19. Thyratrons and ignitrons are similar because

(A) both have cold cathodes
(B) both have control grids
(C) both are always water-cooled
(D) both depend on ionization

19. A B C D

20. A power ratio of 100:1 represents a gain of

(A) 20 db.
(B) 10 db.
(C) 100 db.
(D) 2 db.

20. A B C D

21. The effect of reverse bias on a PN junction is to
- (A) remove the barrier
- (B) move the carriers away from the junction
- (C) move the carriers towards the junction
- (D) have no effect on the carriers

21.
A B C D

22. A silicon controlled rectifier (SCR)
- (A) has electrical characteristics similar to a thyratron
- (B) has only one junction
- (C) is a two-terminal device
- (D) is limited to low current applications

22.
A B C D

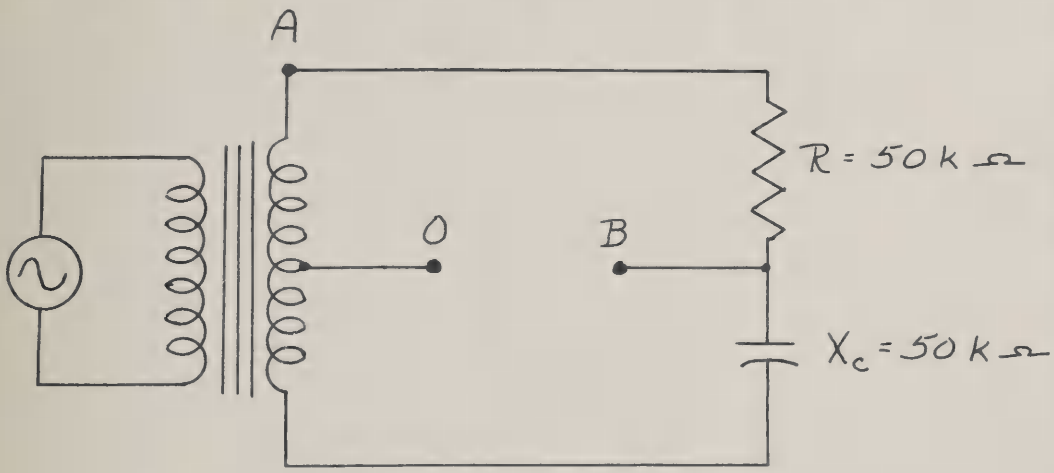
23. Forward bias on a transistor junction
- (A) is the normal bias on the emitter-base junction
- (B) has the same polarity as the barrier potential
- (C) is the normal bias on the collector-base junction
- (D) causes holes in P-type material to move away from the junction

23.
A B C D

24. In a single stage transistor amplifier, phase reversal of the signal occurs
- (A) only in the common-collector circuit
- (B) in the common-emitter circuit using either PNP or NPN transistors
- (C) in the common-emitter circuit using a PNP but not an NPN transistor
- (D) in the common-base circuit using a PNP transistor

24.
A B C D

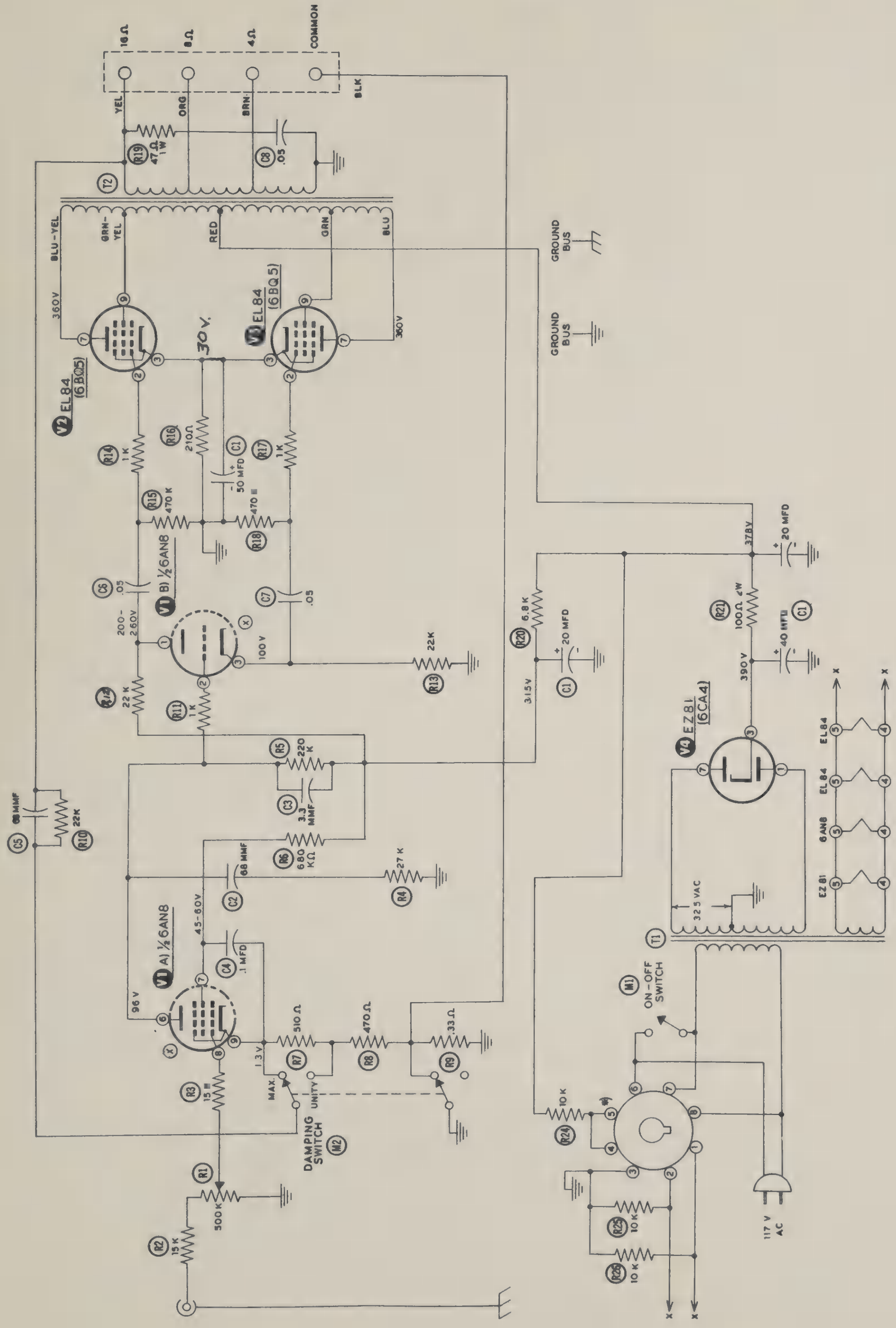
25. What phase angle exists between the voltages OA and OB in the diagram below?



- (A) 30°
- (B) 45°
- (C) 90°
- (D) 120°

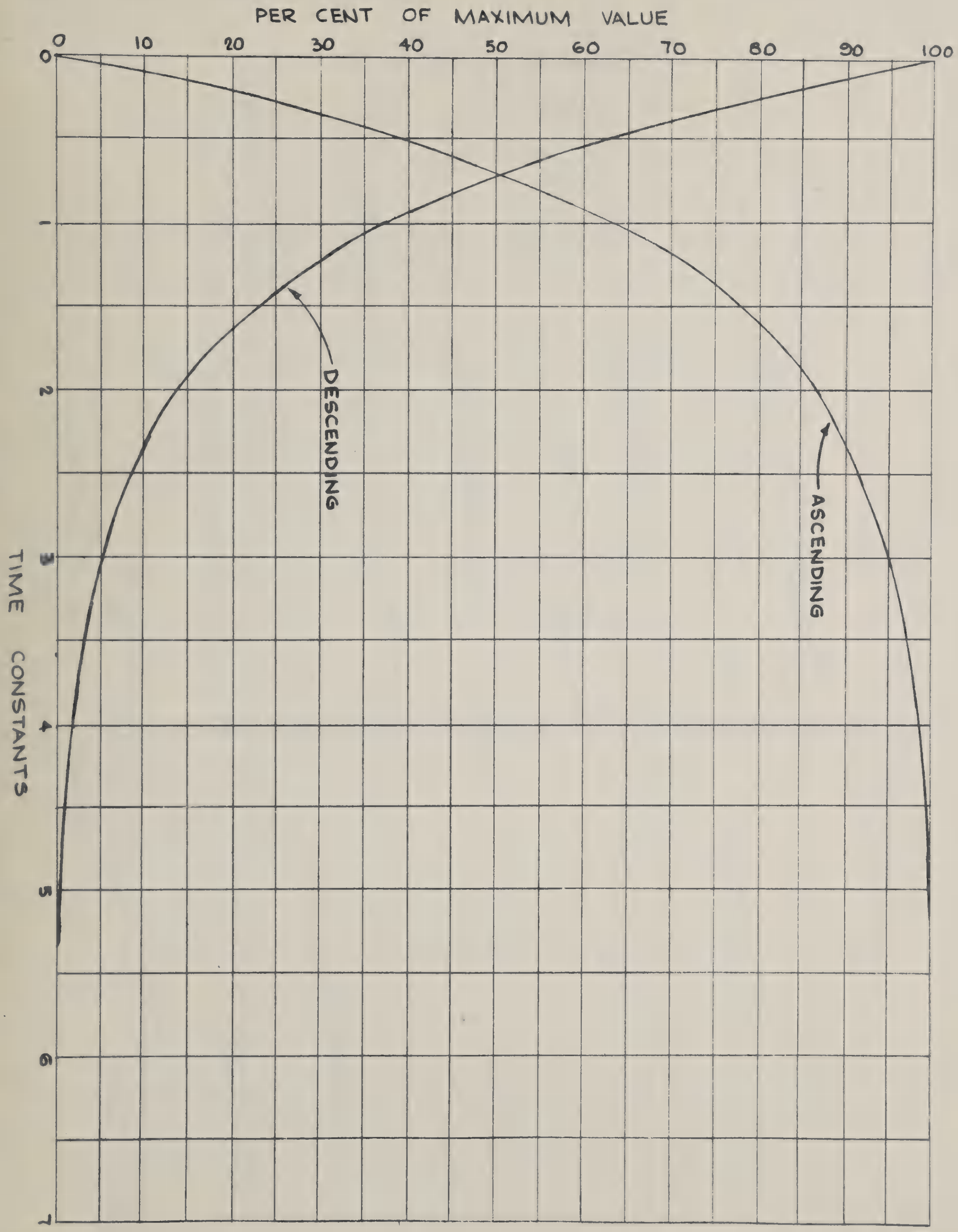
25.
A B C D

To be used in answering Question 3.



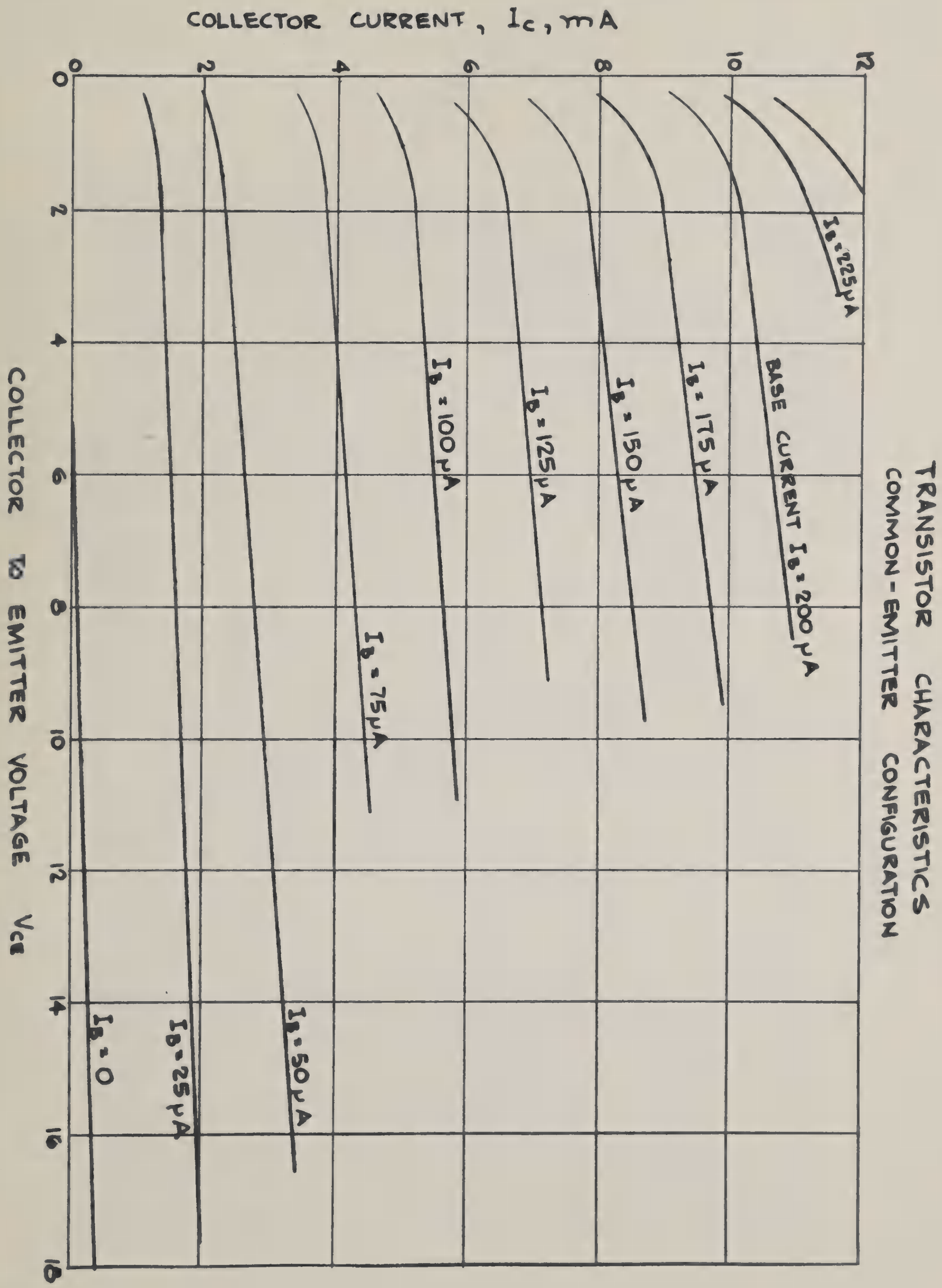
NAME.............................. FORM.......... SCHOOL.....................

To be used in answering Question 9.



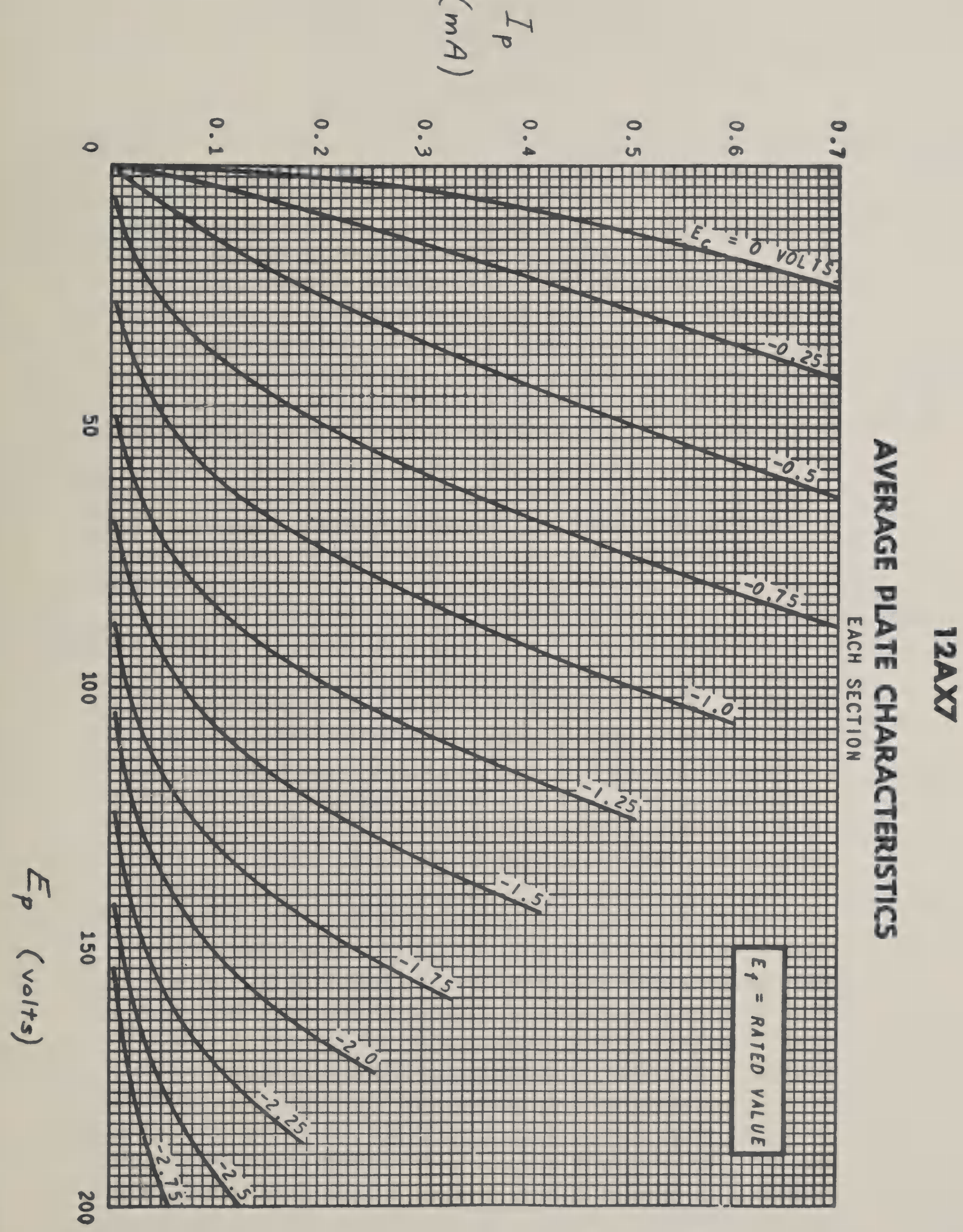
NAME.................................. FORM.......... SCHOOL......................

To be used in answering Question 12.



NAME.................................... FORM.......... SCHOOL.......................

To be used in answering Question 13.



NAME.................................... FORM.......... SCHOOL.........................

DEPARTMENT OF EDUCATION, ONTARIO

GRADE 12 DEPARTMENTAL EXAMINATIONS, 1966

COMBINED APPLIED ELECTRICITY AND APPLIED ELECTRONICS

TIME — 2½ HOURS

NOTE 1. *The Presiding Officer will provide you with Part A (which includes diagram sheets to be used in answering Questions 5, 9 and 10,) and Part B at the beginning of the examination period.*

NOTE 2. *Your name and form, and the name of your school are to be written clearly at the top of Part B, on the diagram sheets, and on each examination book.*

NOTE 3. *Mathematical tables are available from the Presiding Officer if required.*

Values

PART A

9 1. The high-voltage windings of a three-phase transformer are star-connected. The low-voltage windings are delta-connected. The turns ratio between the high-voltage and the low-voltage windings is 10:1. The transformer is supplied by a three-phase, four-wire system whose line voltage is 4156.8 volts. The secondary supplies energy to a three-phase, industrial motor load of 60 amperes per line wire.

Determine

(*a*) the secondary line voltage,
(*b*) the kva. output of the transformer,
(*c*) the primary line current.

Assume the exciting current to be negligible.

7 2. A motor circuit supplies a 7½-hp., 220-volt, three-phase, squirrel-cage induction motor. The motor's nameplate current is 23 amperes.

State

(*a*) the current rating of the switch,
(*b*) the current rating of the fuses,
(*c*) the size of the conductors with type TW insulation,
(*d*) the size of the rigid conduit,
(*e*) the rating of the overload relays.

Answer *either* Question 3 or 4 but not both

Either

7 3. Three loads, each having a resistance of 16 ohms and an inductive reactance of 12 ohms, are delta-connected to a 220-volt, three-phase supply.

Find

(*a*) the impedance per phase,
(*b*) the current per phase,
(*c*) the three-phase power.

OR

7 4. A six-pole, three-phase, 60-cycle, squirrel-cage induction motor has a full-load speed of 1140 rpm.

Determine

(*a*) the synchronous speed,
(*b*) the slip,
(*c*) the per cent slip,
(*d*) the rotor frequency.

10 5. Complete the accompanying diagram of a magnetic "across-the-line" starter controlling a three-phase, squirrel-cage induction motor. The two stop-start stations, and the one stop-jog station are to be connected in the circuit at the locations shown.

CONTINUED OVER→

Values

Answer *either* Question 6 or 7 but not both

Either

9 6. (*a*) Draw the circuit diagram of two single-phase wattmeters, three ammeters, and three voltmeters connected for measuring the power, line voltage, and line current supplied to a balanced, delta-connected, three-phase load. Show polarity marks where necessary.

(*b*) One of the wattmeters indicates zero and the other indicates 1200 watts. What is the total power, and the power factor of the load?

OR

9 7. (*a*) Draw the block diagram for a typical superheterodyne A.M. broadcast band receiver.

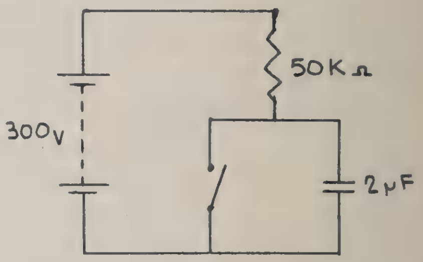
(*b*) Assume that the above receiver is tuned to receive a particular incoming A.M. signal of 1000 kc. carrier frequency. Indicate on the block diagram typical frequencies of the signals that would be found in the various blocks when the receiver is so operating. Neglect sideband frequencies.

4 8. Name *one* practical application, or use, for any *four* of the following devices.

(*a*) Phototube
(*b*) Thyratron
(*c*) Saturable core reactor
(*d*) Silicon controlled rectifier
(*e*) Germanium Diode
(*f*) Zener Diode

6 9. Refer to the universal time-constant graph on the sheet provided, when answering this question.

In the circuit shown, the capacitor is first discharged by closing the switch. The switch is now opened. How long will it take for the voltage across the capacitor to reach 285 volts after the switch is opened?



10 10. Refer to the 12AX7 plate characteristics graph on the sheet provided when answering this question.

A 12AX7 triode is used in an amplifier circuit. The plate supply potential E_{bb}, is 120 volts, and the bias E_C, is -0.75 volts in order to hold the quiescent (zero signal) plate current at 0.3 milliamperes.

(*a*) Use the plate characteristics for the 12AX7 to determine the load resistance (R_L) required by this amplifier.

(*b*) Calculate the resistance of the self-bias resistor (R_K).

(*c*) Calculate the voltage amplification of this amplifier. Assume an input signal of 0.5 volts (peak-to-peak), and proper by-passing of R_K.

(*d*) Calculate the minimum capacitance necessary to properly by-pass R_K, if the low frequency limit of the amplifier is 100 cycles per second.

Answer *either* Question 11 or 12 but not both

Either

12 11. Answer any *six* of the following in one to four lines.

(*a*) What was the reason for using an electron gun of the "slashed", or "bent" type, in early television picture tubes?

(*b*) Why is it possible to use a straight electron gun in a modern television picture tube?

(*c*) For what purpose is an "ion-trap" magnet intended?

(*d*) Name *two* methods by which the electron beam in a television picture tube may be focused.

(*e*) State *two* advantages gained by "aluminizing" the inner surface of a television picture tube including the screen.

(*f*) Picture tubes are frequently classified as 70° tubes, or 90° tubes, or 110° tubes. To what does this method of classification refer?

(*g*) With reference to a 21 inch picture tube, to what dimension does the 21 inch measurement apply?

(*h*) State *one* reason for having a convex shape for the face of a television picture tube.

OR

Values

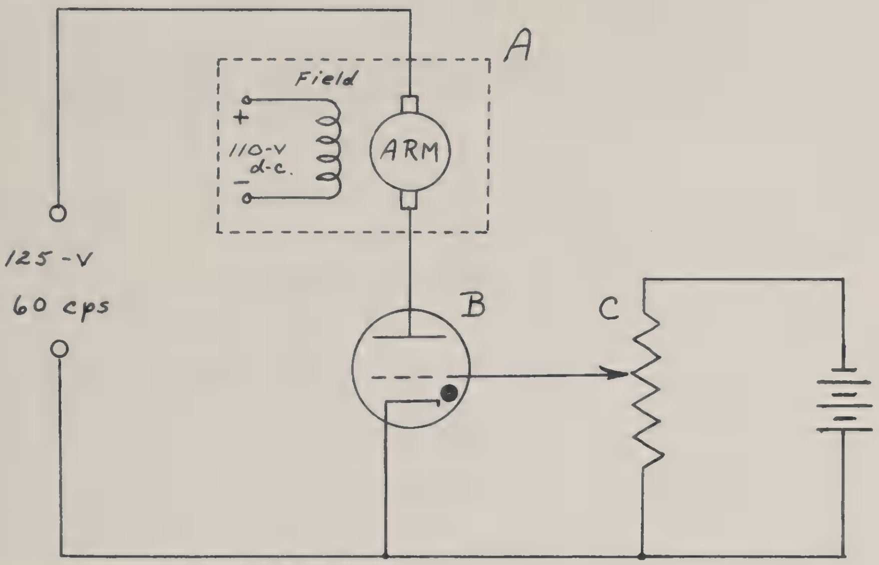
12 12. Refer to the diagram below when answering this question.

(*a*) What is the purpose of the industrial circuit represented by the diagram?

(*b*) Name the component represented by the symbol "B".

(*c*) What is the full name of the apparatus enclosed by the dotted line, and labelled "A"?

(*d*) What will be the effect on "ARM", if the slider on the variable resistor "C" is moved upwards?



7 13. An inductance, a capacitance, and a resistance are connected to a source of alternating voltage as shown.

Answer the following in the order most convenient for you.

(*a*) Draw the vector diagram (phasor diagram) approximately to scale. All voltages and currents in the circuit should be represented.

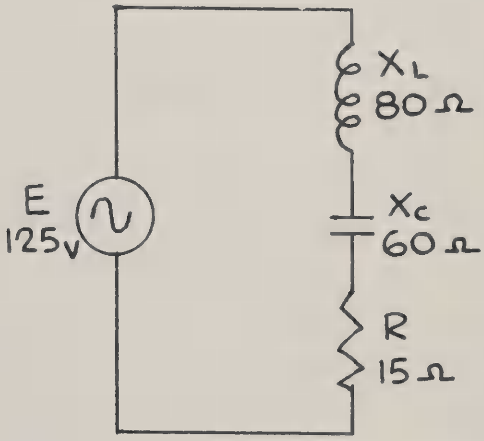
(*b*) Calculate the voltage across the inductance.

(*c*) Calculate the voltage across the capacitance.

(*d*) Calculate the voltage across the resistance.

(*e*) Calculate the current supplied by the source.

(*f*) Calculate the circuit impedance.



DEPARTMENT OF EDUCATION, ONTARIO

GRADE 12 DEPARTMENTAL EXAMINATIONS, 1966

COMBINED APPLIED ELECTRICITY AND APPLIED ELECTRONICS

PART B

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NAME

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FORM

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NAME OF SCHOOL

NOTE. *The total value of Part B is 19 marks. All items have equal value.*

There are several suggestions for answering or completing each of the following questions or incomplete statements. Select the correct response, and circle its *letter* in the answer column at the right.

1. In a junction diode
   (A) two junctions are needed
   (B) heater current is needed
   (C) two different types of semiconductors are needed
   (D) three leads are needed

1. A B C D

2. A semiconductor material containing acceptor atoms is called
   (A) intrinsic
   (B) P-type
   (C) N-type
   (D) A-type

2. A B C D

3. The highest possible d-c output under no-load conditions for a cascade voltage doubler with a 120 v rms input would be
   (A) 339 volts
   (B) 240 volts
   (C) 168 volts
   (D) 288 volts

3. A B C D

4. The majority carriers in semiconductor materials are
   (A) holes in P-type material
   (B) holes in N-type material
   (C) electrons in P-type material
   (D) acceptor atoms in N-type material

4. A B C D

5. Two voltage amplifier stages in cascade, each having a gain of 30 will require
   (A) a 100 millivolt input to produce a 30 volt output
   (B) a 10 millivolt input signal to produce a 9 volt output
   (C) a 100 millivolt input signal to produce a 6 volt output
   (D) a 100 millivolt input to the second stage to produce a 6 volt output

5. A B C D

6. Surge currents through the diode rectifier in a power supply, are most severe when
   (A) no filter is used
   (B) a choke input filter is used
   (C) a capacitor input filter is used
   (D) the load is removed

6. A B C D

7. Electrolytic capacitors are used for coupling between transistor amplifier stages because
   (A) transistors have a higher input impedance than vacuum tubes
   (B) a low capacitive reactance is needed
   (C) a high leakage resistance is needed
   (D) polarity need not be observed

7. A B C D

8. The ripple frequency in the output of a bridge rectifier using four diodes that is operating on a 400-cycle supply is
   (A) 200 c.p.s.
   (B) 400 c.p.s.
   (C) 800 c.p.s.
   (D) 1200 c.p.s.

8. A B C D

CONTINUED OVER→

9. A power transformer having an input of 120 volts and 1 ampere, and delivering 2 amperes to a load of 15 ohms resistance has

(A) no copper loss
(B) an efficiency of 50%
(C) an efficiency of 200%
(D) the secondary voltage and current out of phase by 90°

9. A B C D

10. Thyratrons and ignitrons are similar because

(A) both have cold cathodes
(B) both have control grids
(C) both are always water-cooled
(D) both depend on ionization

10. A B C D

11. A power ratio of 100:1 represents a gain of

(A) 20 db.
(B) 10 db.
(C) 100 db.
(D) 2 db.

11. A B C D

12. An ammeter may be made from a D'Arsonval galvanometer by connecting it

(A) across the terminals of the load
(B) in series with a low resistance shunt
(C) in parallel with a low resistance shunt
(D) in series with a shorting switch

12. A B C D

13. According to Table 5 of the 1963, H.E.P.C. Ontario Electrical Code, the maximum number of #10 AWG conductors with TW insulation that may be placed in a $\frac{3}{4}$-inch conduit is

(A) 2
(B) 3
(C) 4
(D) 5

13. A B C D

14. An electrical instrument that can be damaged by excessive current even when its needle is deflecting less than full scale is

(A) a wattmeter
(B) an ohmmeter
(C) a voltmeter
(D) an ammeter

14. A B C D

15. A single-phase autotransformer supplies current at 200 volts to a load of pure resistance. The input to the transformer is 20 amperes at 500 volts. The winding currents are

(A) 50 and 70 amperes
(B) 20 and 50 amperes
(C) 20 and 30 amperes
(D) 20 and 70 amperes

15. A B C D

16. A series circuit containing resistance, inductance and capacitance is connected to an a-c supply whose frequency is variable. When the frequency is made higher than the resonant frequency the circuit is

(A) inductive
(B) capacitive
(C) resistive
(D) synchronous

16. A B C D

17. In checking the insulation resistance of the windings of a motor or a generator one would normally employ

(A) a Wheatstone bridge
(B) a Megger
(C) a voltmeter and an ammeter
(D) an impedance bridge

17. A B C D

18. The usual reason for connecting a capacitor in parallel with a single-phase induction motor is to

(A) raise the circuit power factor
(B) assist in starting the motor
(C) increase the line current
(D) reduce the in-phase current

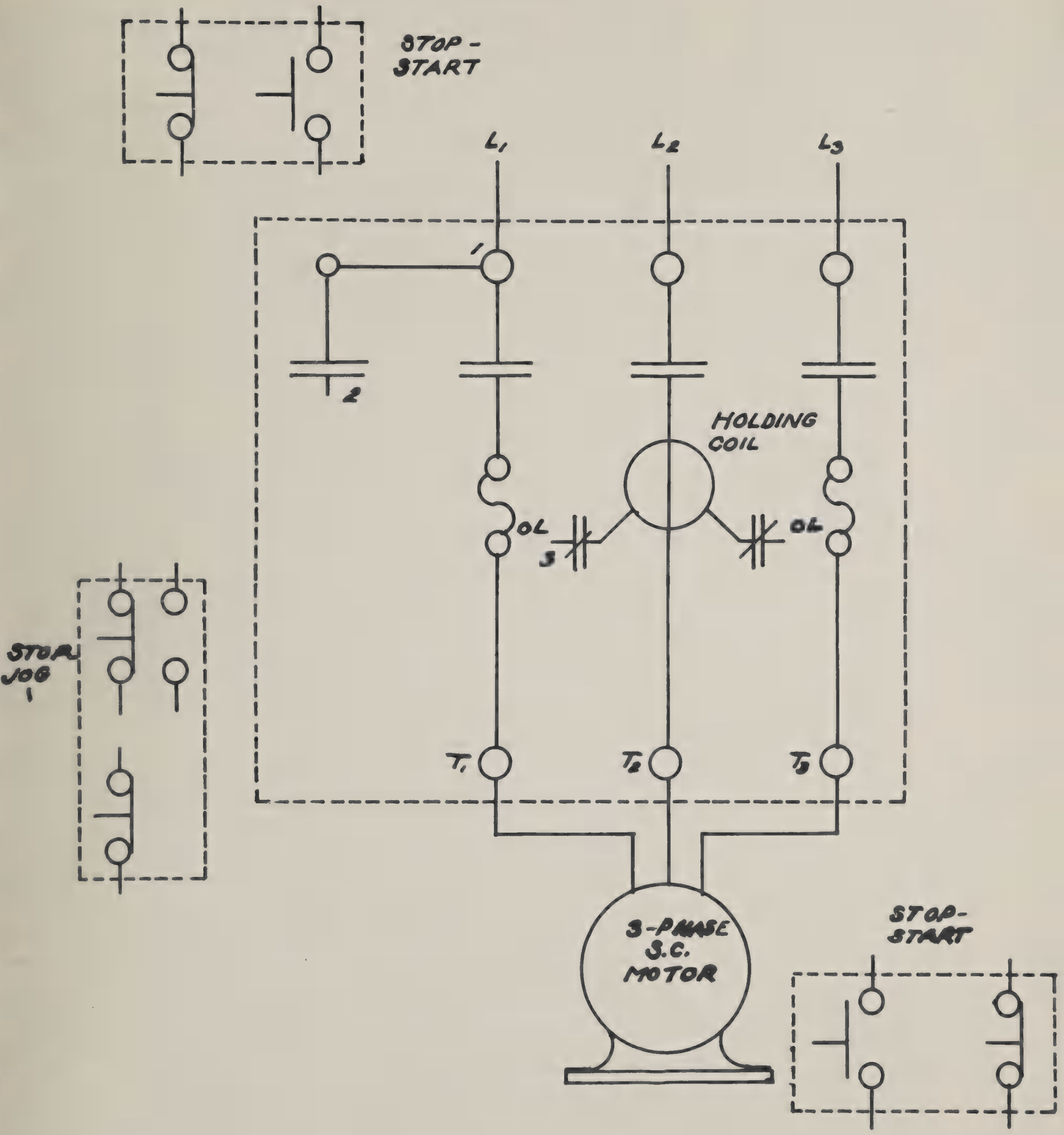
18. A B C D

19. A capacitor-start, induction-run, single-phase motor is used in preference to a split-phase, resistance-start, single-phase motor to

(A) improve the power factor
(B) provide improved starting torque
(C) reduce television interference
(D) reduce arcing at the contacts

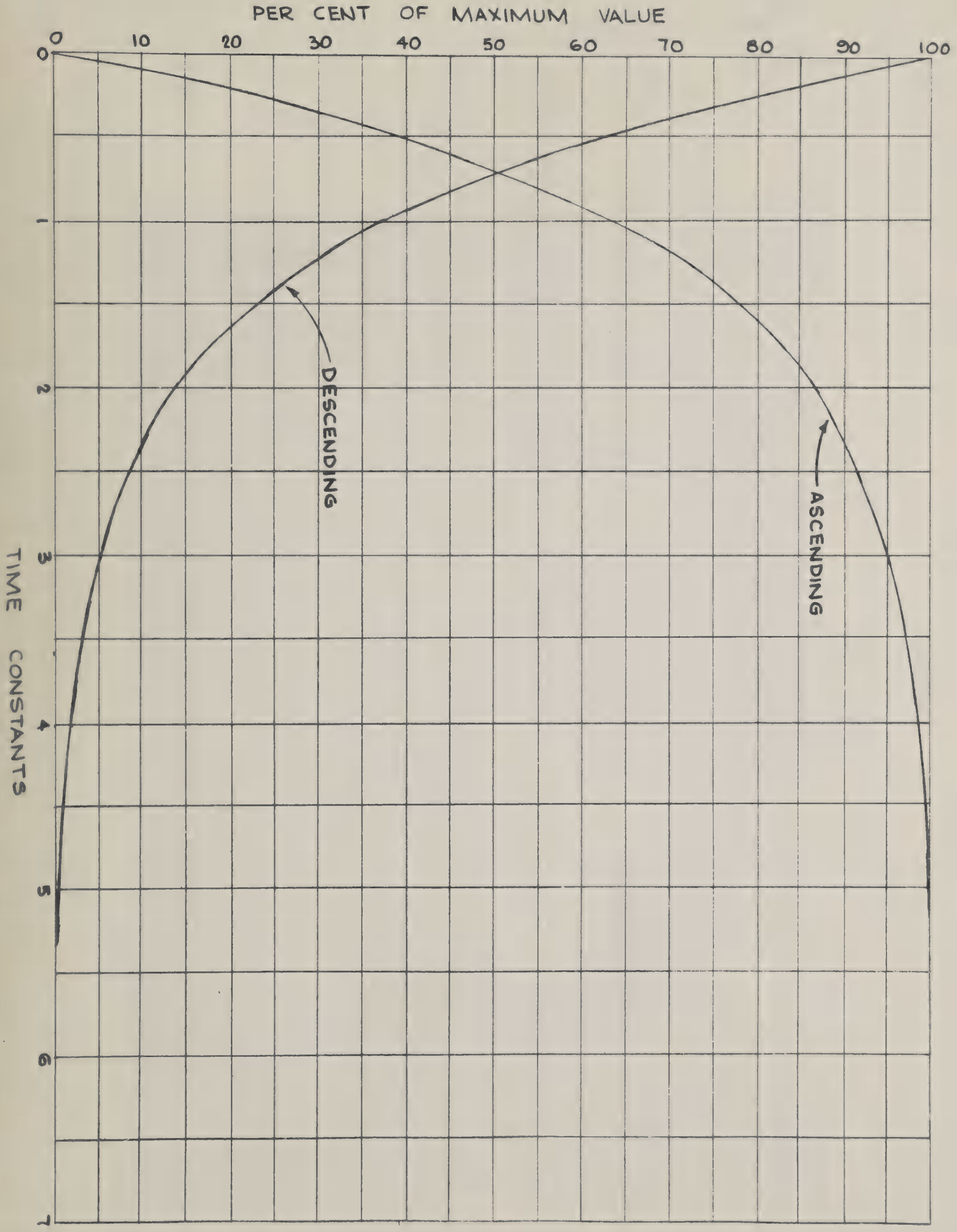
19. A B C D

To be used in answering Question 5.



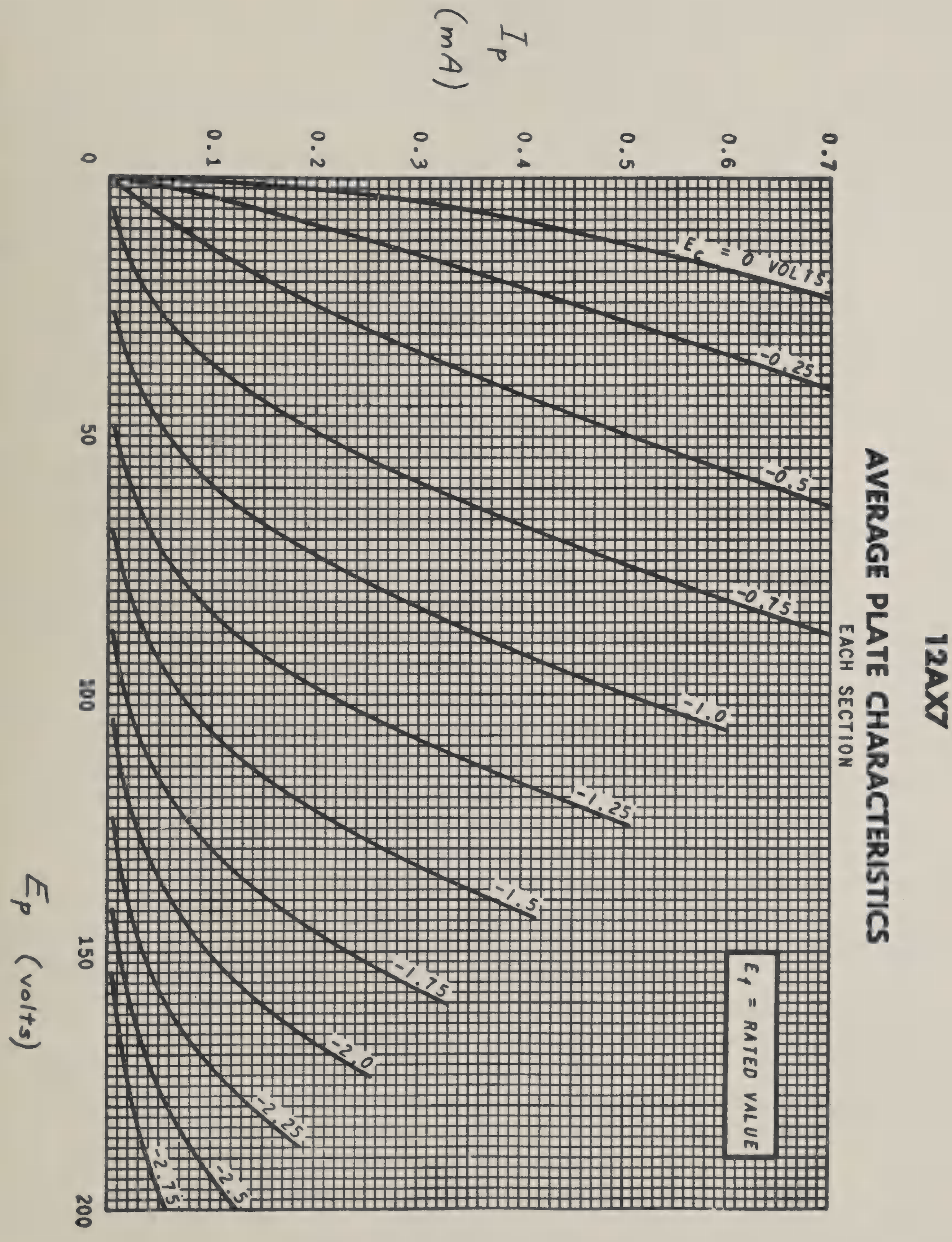
NAME.................................... FORM............ SCHOOL.....................................

To be used in answering Question 9.



NAME.................................. FORM.......... SCHOOL.........................

To be used in answering Question 10.



NAME.............................. FORM.......... SCHOOL........................

DEPARTMENT OF EDUCATION, ONTARIO

GRADE 12 DEPARTMENTAL EXAMINATIONS, 1966

AUTO MECHANICS

TIME — 2½ HOURS

NOTE 1. *The Presiding Officer will provide you with Part A and Part B at the beginning of the examination period.*

NOTE 2. *Your name and form, and the name of your school, are to be written clearly at the top of Part B and on each examination book.*

PART A

Values

NOTE. *Answer any EIGHT questions in Part A.*

6 1. (*a*) Describe the conditions or malfunctions resulting from over tolerances and under tolerances in the following engine service operations.

(i) fitting piston rings
(ii) adjusting engine valve lash
(iii) removing cylinder top ridge

2 (*b*) State why manufacturers' specifications are important to Automotive Servicing.

2 2. (*a*) What will be the result in starter drive operations if there is an open circuit in the starter solenoid hold-in-winding?

6 (*b*) Define the following terms that are used in the discussion of rear axle gears.

(i) backlash
(ii) tooth face
(iii) tooth flank
(iv) heel
(v) toe
(vi) clearance

8 3. Make a diagram, showing the method of connecting a voltmeter and an ammeter to the regulator charging circuit to determine what the regulator settings are for voltage and amperage.

8 4. Describe, in point form, the combined operation of a vacuum ignition spark advance and a mechanical ignition spark advance. Illustrate the ignition spark advance curves with a chart.

6 5. (*a*) State at least *four* possible causes for *each* of the following customer complaints.

(i) engine backfires through the exhaust
(ii) engine backfires through the carburetor
(iii) engine misfires on one cylinder

2 (*b*) Explain why it is important to keep universal joint yokes in their original relationship during reassembly.

3 6. (*a*) Explain how the upper and lower front suspensions are designed to maintain the front wheels in almost vertical alignment under all road conditions.

3 (*b*) State *three* possible causes of tire squeal when a car is turning a corner.

2 (*c*) List *four* essential good-will services that are necessary to ensure good public relations, when performing Automobile Maintainance.

6 7. (*a*) State the purpose of *three* of the following sections of the power steering unit.

(i) oil pump
(ii) spool valve
(iii) power piston or cylinder
(iv) connecting linkage
(v) relief valve

1 (*b*) State what will happen if the primary cup in the master cylinder leaks.

1 (*c*) State what will happen if the secondary cup in the master cylinder leaks.

CONTINUED OVER→

Values

6 8. (*a*) List, in point form, the correct procedure to adjust an automatic choke. Name the type of choke selected.

2 (*b*) Explain the meaning of the term "three phase" in regard to an alternating current generator.

4 9. (*a*) Describe how reverse is obtained through use of a planetary gear system.

2 (*b*) State the conclusion you would make concerning the ignition timing if the timing mark has not reached the pointer when the timing light flashes. Give a reason for your answer.

2 (*c*) Briefly describe the difference between a hot and a cold spark plug.

8 10. State the correct procedure to remove, clean, inspect, lubricate, replace and adjust front wheel bearings on a vehicle of your choice.

8 11. List *four* types of braking difficulties and outline the possible causes and corrections for *each* of these types.

8 12. List *eight* clutch parts that should be examined during a clutch overhaul and list the points to observe when examining them.

DEPARTMENT OF EDUCATION, ONTARIO

GRADE 12 DEPARTMENTAL EXAMINATIONS, 1966

AUTO MECHANICS

PART B

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NAME

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FORM

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NAME OF SCHOOL

NOTE 1. *Answer all questions in Part B. The total value of this Part is 20 marks.*
NOTE 2. *Part B is to be inserted in your examination book before it is handed in at the end of the examination period.*

There are four suggestions for completing each of the following incomplete statements. Select the correct response and circle its *letter* in the answer column at the right.

1. The generator cut-out relay
   (A) cuts the generator out of the circuit when output becomes excessive
   (B) opens the circuit from generator to battery when the engine is stopped to prevent battery discharge
   (C) cuts resistance in and out of the field circuit to control output
   (D) prevents over charging of the battery

1. A B C D

2. Burned and pitted generator commutator bars usually indicate
   (A) a grounded field coil
   (B) open circuit in field windings
   (C) a grounded brush
   (D) an open circuit in the armature

2. A B C D

3. With one rear axle held and the other spinning on ice the speed of the spinning axle
   (A) increases to twice normal speed
   (B) reduces to one half normal speed
   (C) remains at normal speed
   (D) reverses in direction

3. A B C D

4. When a Hotchkiss drive is used with leaf springs the torque reaction is absorbed by
   (A) the propeller shaft
   (B) the rear springs
   (C) a torque tube
   (D) a radius rod

4. A B C D

5. The polarity of the secondary current at the spark plug terminal is
   (A) positive to negative
   (B) negative to positive
   (C) alternating
   (D) always the same as the battery polarity

5. A B C D

6. In basic fundamentals of magnetism
   (A) like poles repel
   (B) like poles attract
   (C) unlike poles repel
   (D) two similar poles pull together

6. A B C D

7. In the automotive alternating current generator the part which is rotated is
   (A) the field assembly
   (B) the output windings
   (C) the brushes
   (D) the diodes

7. A B C D

8. The advantage of a wide plug gap is that
   (A) a longer spark results
   (B) more mixture can be surrounded by the spark, thus giving better ignition
   (C) less frequent adjustments are necessary
   (D) there is less chance of pre-ignition

8. A B C D

9. The firing order of most 6 cylinder engines is
   (A) 1-4-2-5-3-6
   (B) 1-5-3-6-2-4
   (C) 1-3-5-2-4-6
   (D) 1-4-3-6-2-5

9. A B C D

CONTINUED OVER→

10. The primary brake shoe is always the shoe
(A) which is placed next to the wheel cylinder in a forward rotation
(B) which is placed toward the rear of the vehicle
(C) which is placed toward the front of the vehicle
(D) which assists mainly in braking when the vehicle is backed up

10.
A B C D

11. The cells in an automobile battery are connected in
(A) parallel
(B) series
(C) series parallel
(D) parallel series

11.
A B C D

12. When an ammeter calibrated from 0 to 50 amperes is connected to a circuit it is placed
(A) in parallel
(B) in either series or parallel
(C) in series
(D) across the battery terminals

12.
A B C D

13. The purpose of the manifold heat control valve is to
(A) aid in starting a cold engine
(B) direct heat to the intake manifold during warm up
(C) direct heat to the exhaust manifold during warm up
(D) control the temperature of the exhaust manifold

13.
A B C D

14. The octane rating of a fuel is a measure of
(A) its B.T.U. content
(B) the power it will develop
(C) its antiknock qualities
(D) its resistance to vapour lock

14.
A B C D

15. Vacuum in a carburetor throat is greatest at
(A) the smallest diameter
(B) the largest diameter
(C) does not vary
(D) a point immediately below the air cleaner

15.
A B C D

16. Torque is defined as
(A) turning effort
(B) developed horsepower
(C) a special type of wrench
(D) a tube used in the drive line

16.
A B C D

17. The fluid that should be used in cleaning hydraulic brake parts is
(A) gasoline
(B) cleaning solvent (varsol)
(C) alcohol
(D) carbon tetrachloride

17.
A B C D

18. The master cylinder push rod being too long will result in
(A) the closing of the compensating port
(B) the closing of the reservoir port
(C) the opening of the check valve
(D) allowing air to enter the system

18.
A B C D

19. A water distributor tube cools
(A) the exhaust valve seats
(B) the cylinders
(C) the combustion chamber
(D) the cylinder head

19.
A B C D

20. In a four cycle engine operating at 2,000 R.P.M. for four minutes, each valve will open
(A) 2000 times
(B) 1000 times
(C) 500 times
(D) 4000 times

20.
A B C D

DEPARTMENT OF EDUCATION, ONTARIO

GRADE 12 DEPARTMENTAL EXAMINATIONS, 1966

DRAFTING (Architectural and Building Construction)

TIME — 2½ HOURS

NOTE 1. *Your name and form, and the name of your school, are to be written clearly on each examination book.*

NOTE 2. *ALL questions in EACH of the four sections are to be answered.*

SECTION I — STRUCTURAL DESIGN

Values

NOTE. Either the C.I.S.C. or the A.I.S.C. Steel Construction Manual may be used.

7 1. Make the calculations necessary to design a steel column to support an axial load of 60 kips. The unsupported length of the column is 15′ - 0″.

6 2. (*a*) Design by calculation a WF beam to resist bending and to support a U.D.L. of 1000#/lin. ft., plus a concentrated load of 30 kips at the centre of the 20′ - 0″ clear span.

6 (*b*) Check for deflection.

6 3. Design a 3 angle steel lintel for a 6′ - 0″ opening in a 13″ brick masonry wall. Assume 10′ - 0″ of masonry wall above the opening. The weight of the masonry is 120#/cu. ft.

SECTION II — RESIDENCE PLANNING

10 4. Consider the purchase of two homes; one built by a speculative builder, and one designed by an architect and custom built. Outline *five* features which might be desirable for each arrangement.

7 5. List, in point form, the factors which you would take into account before purchasing a property for a new home.

8 6. Compare the shelter requirements of a young newly married couple with an elderly couple approaching retirement age.

SECTION III — MATERIALS AND METHODS AND ESTIMATING

5 7. In preparing the specification for a residence or other building a knowledge of materials and methods is vital. State, in point form, why this is the case.

12 8. Explain the procedure one should follow in calculating the heat loss for a building.

8 9. Contrast the approach of the architect with that of the general contractor in preparing a cost estimate for a building project.

SECTION IV — HISTORY OF ARCHITECTURE

10 10. Describe, in point form, Gothic cathedral planning and character.

5+5 11. (*a*) On a half sheet of examination paper sketch a transverse section through a Gothic cathedral and name the parts.

5 (*b*) Describe the structural principles involved in the transverse section referred to in (*a*).

DEPARTMENT OF EDUCATION, ONTARIO

GRADE 12 DEPARTMENTAL EXAMINATIONS, 1966

DRAFTING (MECHANICAL)

TIME — 2½ HOURS

NOTE 1. *Your name and form, and the name of your school, are to be written clearly on each examination book.*

NOTE 2. *Slide rules and geometry instruments may be used.*

NOTE 3. *Each question has a value of 5 marks.*

SECTION I, MACHINE DESIGN

Answer any SEVEN questions in Section I.

1. Define any *five* of the following terms.
   - (*a*) forge
   - (*b*) gauge line
   - (*c*) web
   - (*d*) core
   - (*e*) chamfer
   - (*f*) neck
   - (*g*) caseharden
   - (*h*) anneal

2. Name *five* principal metal-working manufacturing processes, and for *each*, sketch a typical part that can be produced by *each* of the processes named.

3. Sketch in section the following anti-friction bearings and use an arrow or arrows to indicate the principal load direction or directions.
   - (*a*) thrust ball bearing
   - (*b*) radial ball bearing
   - (*c*) tapered roller bearing

4. Answer briefly any *five* of the following.
   - (*a*) Contrast a clutch to a coupling.
   - (*b*) Contrast a keyway to a keyseat.
   - (*c*) Contrast a friction bearing to an anti-friction bearing.
   - (*d*) Contrast a bolt to a cap screw.
   - (*e*) Contrast a taper pin to a dowel.
   - (*f*) Contrast an assembly drawing to a detail drawing.
   - (*g*) Contrast a cope to a drag.

5. (*a*) Sketch in section a sharp "V" (or similar) *internal* screw thread and show the position of the following.
   - (i) crest
   - (ii) minor dia.
   - (iii) root
   - (iv) major dia.

   (*b*) A screw thread has 12 TPI. Calculate the pitch to 3 decimal places.

   (*c*) Distinguish between a left hand thread and a right hand thread.

6. Define *each* of the following terms.
   - (*a*) transition fit
   - (*b*) allowance
   - (*c*) clearance fit
   - (*d*) tolerance
   - (*e*) interference fit

7. The limits for a shaft are 1.5010 and 1.5003. The limits for a bored hole are 1.5000 and 1.5008.
   - (*a*) Name the type of fit, and give the reason for your answer.
   - (*b*) What is the allowance for the fit?
   - (*c*) What is the tolerance for each part?
   - (*d*) If the hole limits and shaft tolerance remain as stated above, what will be the shaft limits if the allowance for a clearance fit is plus .0012?

CONTINUED OVER→

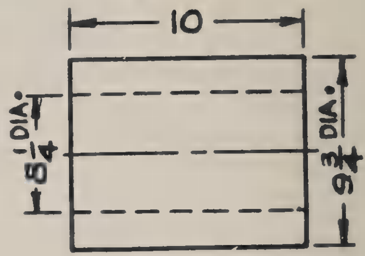
8. Make *two* view sketches of any *five* of the following.

(*a*) a Woodruff key	(*e*) a stud
(*b*) a socket head cap screw	(*f*) a cotter pin
(*c*) a splined hole	(*g*) a shaft collar
(*d*) a hex head cap screw	

9. (*a*) Define and classify the following SAE steel specifications.
   (i) 1055 (ii) 2340
   (*b*) Give the equivalent AISI specification for SAE 1090 steel.

10. (*a*) On *one* arc welding symbol show the following information.
    (i) The weld is to be done outside the shop, and welded all around.
    (ii) There is a "V" weld on the arrow side, and a "J" weld on the other side.
    (iii) The "V" weld is $\frac{1}{2}$ deep, and has an angle per side of 30°.
    (iv) The "J" weld is flush and $\frac{5}{8}$ deep.
    (*b*) Sketch and name any *three* basic welded joints.

11. The cast iron bushing shown is to be finished all over. If the pattern maker allows $\frac{1}{8}''$ for machining and if cast iron weighs .27 lbs. per cubic inch, calculate the weight of the casting.



SECTION II, GEARING AND CAMS

Answer any FOUR questions in Section II.

12. Make a sketch of a typical bevel gear in section, and label any *five* of the following.

(*a*) cone distance	(*e*) pitch angle
(*b*) face	(*f*) dedendum
(*c*) pitch diameter	(*g*) cutting (root) angle
(*d*) face angle	

13. *Given*:	*Calculate*:
Gear and Pinion, $14\frac{1}{2}$° spur.	(*a*) pitch diameter of pinion
R.P.M. of pinion is 2500.	(*b*) R.P.M. of gear
Pitch diameter of gear is 15 in.	(*c*) number of teeth for the pinion
Centre to centre distance is 12 in.	(*d*) number of teeth for the gear.
Circular pitch is 1.0472 in.	

14. Using geometry instruments, draw the displacement diagram for a cam giving the following motion.

Harmonic rise 1.50 inches in 180°
Parabolic (uniformly accelerated and decelerated) fall of 1.50 inches in 180°
Length of diagram to be 6 in. ($\frac{1}{2}$ in. for each 30°)

15. A one start worm has a pitch of .75 in. The worm travels at 1760 R.P.M and the worm gear at 44 R.P.M. The centre distance is 6.25 in. Calculate the following, accurate to two decimal places.

(*a*) speed ratio	(*c*) pitch diameter of worm
(*b*) pitch diameter of worm gear	(*d*) circular thickness on worm gear

16. Define any *five* of the following spur gear terms.

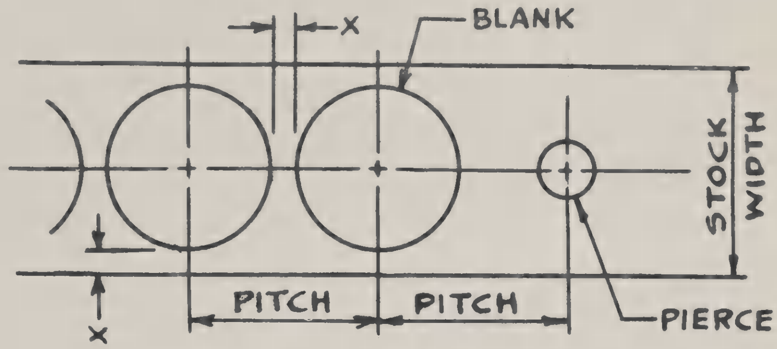
(*a*) diametral pitch	(*e*) clearance
(*b*) chordal thickness	(*f*) whole depth
(*c*) circular pitch	(*g*) circular thickness
(*d*) working depth	

17. *Given*:	*Calculate*:
Gear and pinion, 20° stub tooth form.	(*a*) number of teeth on gear
R.P.M. of pinion is 3000.	(*b*) the diametral pitch
R.P.M. of gear is 1800.	(*c*) pitch diameter of the pinion
The pinion has 24 teeth.	(*d*) pitch diameter of the gear
Outside diameter of gear is 8.320 in.	

SECTION III, TOOL AND DIE DESIGN

Answer any FOUR questions in Section III.

18. A progressive pierce and blank punch and die is to be designed for a 2.375 dia. mild steel washer with a .875 dia. hole. The washer is .060 thick. The scrap allowance, shown as "X" on the drawing, is 1.25 times stock thickness. The die clearance is to be 5% of the stock thickness. Calculate *each* of the following, accurate to three decimal places.



(*a*) piercing punch dia.
(*b*) blanking punch dia.
(*c*) pilot dia.
(*d*) piercing die dia.
(*e*) blanking die dia.
(*f*) stock width
(*g*) centre to centre distance of blanks (pitch)

19. (*a*) What is the *basic difference* between a jig and a fixture?

(*b*) List and explain *two* main reasons why the use of jigs and fixtures contribute to the economical manufacture of machine parts.

(*c*) Discuss *two* main features to be considered in the design of jigs and fixtures.

20. A .500 dia. hole is to be drilled and then reamed while the part is clamped in one position in the jig.

(*a*) Suggest the drill dia.

(*b*) Sketch in section the bushing arrangement necessary to accomplish the drill and ream operation. Identify the type of bushings used.

21. Compare a low production conventional blanking die to an inverted blanking die with regard to the following.

(*a*) *one* advantage of the inverted die

(*b*) *one* advantage of the conventional blanking die

(*c*) names and materials of *four* principal parts in the conventional blanking die (disregard die set and stop)

(*d*) names and materials of *four* principal parts in the inverted blanking die (disregard die set and stop)

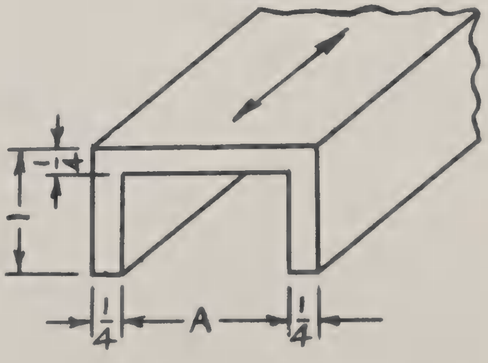
22. Briefly discuss any *five* of the following jig and fixture terms.
(*a*) jig feet
(*b*) foolproofing
(*c*) fixture key
(*d*) plate jig
(*e*) tool setting block
(*f*) chip clearance
(*g*) drill bushing

23. Define any *five* of the following die and punch press terms.
(*a*) shank
(*b*) bolster height
(*c*) die shut height
(*d*) bed
(*e*) die clearance
(*f*) clearance angle
(*g*) punch pad

SECTION IV, STRENGTH OF MATERIALS

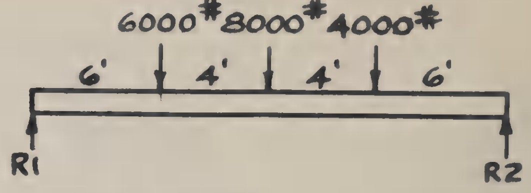
Answer any FOUR questions in Section IV.

24. The steel channel illustrated is to support an axial tensile load of 17,500 lbs. What would be the minimum distance of "A" if the allowable tensile strength is 16,000 lbs. per sq. inch?



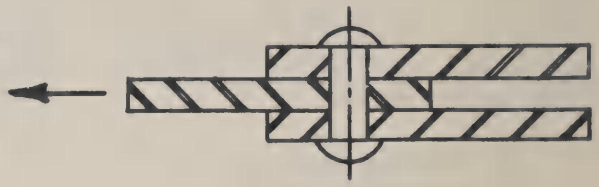
CONTINUED OVER→

25. Calculate R1 and R2 for the beam illustrated. Disregard the weight of the beam.



26. Calculate the tonnage required to pierce and blank a washer having an inside diameter of .750″, an outside diameter of 2.250″, and a thickness of .060″. The ultimate shear strength of the material is 42,000 lbs. per sq. inch.

27. The ultimate shear strength of the .750″ dia. rivet as shown in the sketch is 45,000 lbs. per sq. inch. What force must be exerted on the centre plate to shear the rivet?



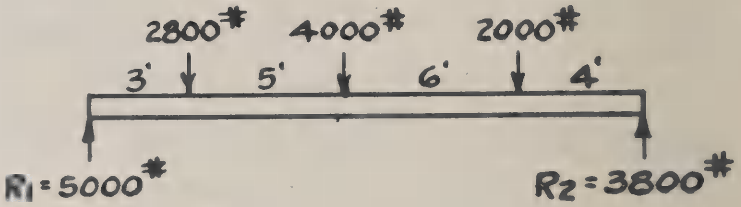
28. Define and illustrate *each* of the following.

- (*a*) simple tensile stress
- (*b*) cantilever beam
- (*c*) simple compressive stress
- (*d*) uniform load
- (*e*) simple shear stress

29. Draw the shear force and bending moment diagrams for the simple beam shown. Disregard the weight of the beam.

Use a length scale of ¼″ to 1′ - 0″ and a force scale of 1/32″ to 100 lbs. on the shear force diagram.

Use a length scale of ¼″ to 1′ - 0″ and a bending moment scale of 1/16″ to 1000 ft. lbs. on the bending moment diagram.



SECTION V, SHEET METAL PATTERN DRAFTING

Answer EITHER Question 30 or 31.

30. (*a*) Name the type of sheet metal development that should be used in producing the sheet metal layout of each of the following.

- (i) a truncated cylinder
- (ii) a conical funnel top
- (iii) a rectangular tin box

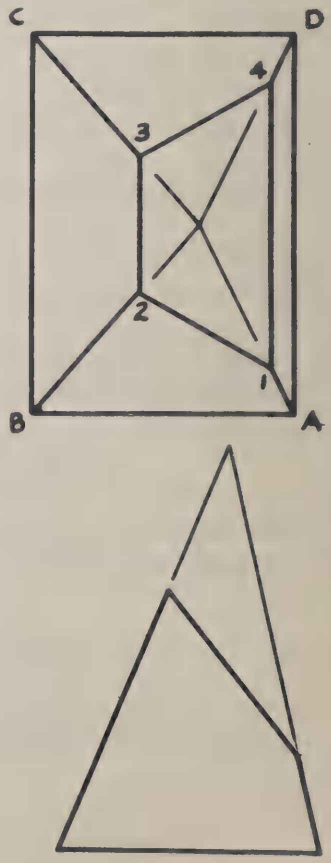
(*b*) Explain what is meant by triangulation.

(*c*) The shortest line on the development is generally the most economical for the seam. Give *two* reasons to support this statement.

(*d*) Sketch *two* views of a square to round on centre transition piece and show how the true lengths would be found. The square is larger than the round.

OR

31. Using geometry instruments, develop the lateral surfaces (sides) of the hollow truncated pyramid illustrated. Label all points on the development. Line A-1 is the seam. (¼″ lap)



DEPARTMENT OF EDUCATION, ONTARIO

GRADE 12 DEPARTMENTAL EXAMINATIONS, 1966

GRAPHIC ARTS

TIME — 2½ HOURS

NOTE 1. *The Presiding Officer will provide you with Part A and Part B at the beginning of the examination period. Part B may be answered at any time during the period.*

NOTE 2. *Your name, form, and name of your school, are to be written clearly at the top of Part B, on the proof sheet, and on each examination book.*

PART A

NOTE. ***Part A will be answered as follows: NINE questions, selected according to the following instructions, constitute a full solution for Part A.***

(*a*) *Schools with Hand Composition and Letterpress*:

Answer *FIVE* questions in Section I and *FOUR* questions in Section III.

OR

Answer *FOUR* questions in Section I and *FIVE* questions in Section III.

(*b*) *Schools with Hand Composition, Letterpress, and Offset Lithography*:

Answer *THREE* questions in EACH of Sections I, III, and IV.

(*c*) *Schools with Hand Composition, Letterpress, and Machine Composition*—(*Ludlow or Linotype or Monotype*):

Answer *FOUR* questions in Section I, *TWO* questions in Section II, and *THREE* questions in Section III.

(*d*) *Schools with Hand Composition, Letterpress, Offset Lithography, and Machine Composition*:

Answer *THREE* questions in Section I, and *TWO* questions in each of Sections II, III, and IV.

PART B

NOTE. ***Part B, consisting of objective type questions, is obligatory for all candidates.***

Values

SECTION I—HAND COMPOSITION

8 1. The Presiding Officer will provide you with the proof and the copy required for answering this question. Proofread the proof, using the copy supplied, and mark corrections.

2 2. (*a*) State *four* major fundamental principles of arrangement common to newspaper advertisements.

6 (*b*) Define *six* of the following terms as applied to typography.

(i) type series
(ii) symmetry
(iii) rivers
(iv) modernistic display
(v) traditional display
(vi) breaking up for colour
(vii) superiors
(viii) lift

5 3. (*a*) Find the cost of setting type for a 4-page folder set in 10-point, each type page measures 20 picas by 30 picas, at $8.10 per 1000 ems.

3 (*b*) When an ornament is used in composition, it serves *three* functions. State the three functions.

6 4. (*a*) Draw a Stone Lay for an ordinary four-page folder, run work-and-turn. Indicate line of cutting (solid line), line of inside fold (broken line) and gripper edge.

2 (*b*) State *two* methods of permanently securing Challenge quoins in position.

2 5. (*a*) State *two* methods of obtaining proportionate areas.

4 (*b*) Illustrate *each* method.

2 (*c*) When setting a letterhead, what factor governs the choice of a type face?

CONTINUED OVER→

Values

4 6. (*a*) Describe how satisfactory results may be obtained in display by the use of any *two* of the following.

(i) contrast
(ii) tone rhythm
(iii) balance
(iv) harmony

3 (*b*) Explain how type groups are arranged in modern display.

1 (*c*) State *one* use of reproduction proofs in letterpress printing.

SECTION II—MACHINE COMPOSITION

LINOTYPE

7. (*a*) The Linotype (Intertype) operator should always be careful to use the proper amount of matrices and spacebands in each line which he sets, or damage and troubles may be caused in many ways.

3 (i) State *three* troubles or *three* types of damage which may be caused by lines being too tight to fit easily between the vise jaws.

2 (ii) List *two* troubles or *two* types of damage which may be caused by lines that are too loose.

3 (*b*) Explain how the invention of the Linotype revolutionized the setting of straight matter.

1 8. (*a*) What device on the Linotype machine is used for a job to be set in all italic or bold face?

2 (*b*) Explain why it is necessary to avoid mixing the different metals, used in the composing room, when distributing jobs.

3 (*c*) Define or state the function of any *six* of the following.

(i) back knife
(ii) ejector blade
(iii) channel entrance
(iv) magazine
(v) matrix
(vi) sorts channel
(vii) spacer
(viii) wedge

1 (*d*) (i) What variation in spacing is required in a line of capitals?

1 (ii) How is this variation obtained?

MONOTYPE

3 9. (*a*) Explain the reasons for the use of compressed air in the operation of the Monotype Keyboard and Caster.

5 (*b*) Describe the operation of the two machines which make up the Monotype System.

3 10. (*a*) List *six* advantages of the Monotype.

2 (*b*) (i) State the percentage of lead, tin and antimony in standard monotype metal.

(ii) What temperature is correct for this metal when casting?

3 (*c*) Explain why spaces found in a mass of Monotype composition should not be mixed with machine-cast spaces in the case.

LUDLOW

3 11. (*a*) When assembling matrices at the Ludlow what point spacing, equivalent to the 3-em space, is used between words for the following type sizes?

(i) 8-point
(ii) 12-point
(iii) 14-point
(iv) 24-point
(v) 30-point
(vi) 42-point

4 (*b*) Explain the method of composition and casting on the Ludlow.

1 (*c*) What range of type sizes may be cast on the Ludlow?

2 12. (*a*) State *two* purposes for which the Ludlow is particularly adapted in newspaper composition.

(*b*) The metal in the crucible must be kept at a definite level.

1 (i) What is this level?

3 (ii) State *three* reasons for maintaining this level of metal in the crucible.

2 (*c*) Describe the use of the following when cleaning the Ludlow.

(i) mouthpiece cover
(ii) well-cleaning tool
(iii) lubriclean solution
(iv) mouthpiece scraper

Values

SECTION III—LETTERPRESS

13. Make up a chart with the following headings: Kind, General Uses, and Basic Sizes, for the stocks listed below.

2 (*a*) bond
2 (*b*) bristol
2 (*c*) cover
2 (*d*) book

2 14. (*a*) List the thicknesses of the following materials.

(i) tympan paper
(ii) tissue
(iii) folio
(iv) sized and supercalendered stock

6 (*b*) What are *three* main factors which necessitate the adjusting of the packing thickness or form height for printing?

4 15. (*a*) Calculate the number of sheets of stock, size 22½" x 28½", required for printing 4000 cards net, size 6" x 10", plus 500 pieces 6" x 10" for spoilage allowance.

4 (*b*) Draw the cutting plan.

3 16. (*a*) State the method by which the following inks dry.

(i) news or soft-finish paper inks
(ii) job inks
(iii) inks for non-absorbent papers

5 (*b*) List the ink ingredients as required below.

(i) two vehicles
(ii) one mineral pigment
(iii) one manufactured pigment
(iv) two driers
(v) two compounds or reducers

6 17. (*a*) State *six* causes of ink offsetting.

2 (*b*) Define the following.

(i) thermography
(ii) scoring

1 18. (*a*) Name one solvent which should be used to clean composition rollers.

2 (*b*) If it should be necessary to use harsher solvents on composition rollers, what treatment should follow?

5 (*c*) List *five* common causes of the following difficulties caused by rollers.

(i) slurs
(ii) roller marks
(iii) ghosts
(iv) shadows

SECTION IV—OFFSET LITHOGRAPHY

2 19. (*a*) State an advantage of a camera with a long focal length over one having a short focal length.

2 (*b*) In camera line work, which aperture (large or small) is generally considered to give the sharper reproduction?

4 (*c*) Camera F stops are 11, 16, 22, 32, 45, 64. If the exposure time at stop F64 is 96 seconds, calculate the exposure time if the stop is adjusted to F16.

2 20. (*a*) A halftone negative is flat. The flash and main exposures cannot be altered. Describe how you would increase contrast.

6 (*b*) If camera copy is a 200-line screen illustration,

(i) indicate the screen reading for a reduction to 50%,
(ii) explain the method you would use to make a 50% reduction.

CONTINUED OVER→

Values

21. List the ingredients in *each* of the following solutions and explain the action of *each* of the ingredients.

2 (*a*) plate gum
2 (*b*) fountain solution
2 (*c*) desensitizing plate etch
2 (*d*) blanket wash

4 22\. (*a*) What are *four* problems encountered in the use of a fountain solution with a very low pH factor?

2 (*b*) Explain the effect on the drying of inks if both the fountain solution and paper stock have a low pH factor.

2 (*c*) One non-mechanical factor will cause the pH value to drift. Name the factor and suggest a corrective measure.

1 23\. (*a*) State the recommended minimum distance from the arc lamp to the vacuum frame for plate exposure.

1 (*b*) What will be the effect on the plate if this distance is reduced?

4 (*c*) If the exposure time for a distance of 2 feet is 4 minutes, determine the exposure when the distance is increased to 3 feet.

2 (*d*) What is *one* result of *each* of the following?
  (i) insufficient exposure to the arc lamp
  (ii) overexposure to the arc lamp

DEPARTMENT OF EDUCATION, ONTARIO

GRADE 12 DEPARTMENTAL EXAMINATIONS, 1966

GRAPHIC ARTS

PART B

....
NAME

....
FORM

....
NAME OF SCHOOL

NOTE 1. *All items in Part B are equal in value. One mark is allowed for each correct answer for a total of twenty-eight marks.*

NOTE 2. *Only those answers which are clearly indicated in the answer column at the right will be marked.*

There are several suggestions for answering or completing each of the following questions or incomplete statements. Select the correct response, and circle its *letter* in the answer column at the right.

1. Wood type is measured in
   (A) points (B) pica lines (C) inches

1. A B C

2. A chase is used in
   (A) lock-up (B) composition (C) make-up

2. A B C

3. A 24-point em quad is
   (A) 24 points square (B) 24 points high (C) 24 points deep

3. A B C

4. In relation to the em quad, the 3-em space is
   (A) three times its width
   (B) one-third its width
   (C) half its width

4. A B C

5. Imposing tables are used to
   (A) place type cases for setting type
   (B) lock up forms for the press
   (C) store type cases

5. A B C

6. Type is set from
   (A) left to right
   (B) right to left
   (C) right to left upside down

6. A B C

7. Spacing is the procedure
   (A) of making each line of type the same length
   (B) of placing blanks between words so they appear to be even
   (C) for measuring

7. A B C

8. A 5-em and a 4-em space together are
   (A) larger than an en quad
   (B) smaller than an en quad
   (C) the same as an en quad

8. A B C

9. When quadding out, the smaller spaces are placed
   (A) at the end of the line
   (B) next to the last word and period
   (C) between the quads that space out at the end of the line

9. A B C

CONTINUED OVER→

10. Type held for another printing is called
(A) dead matter (B) standing matter (C) live matter

10. A B C

11. In type, the lower case "d" looks like the lower case
(A) q (B) p (C) b

11. A B C

12. Leaders are used to
(A) guide the eye across the page
(B) space lines correctly
(C) justify type lines

12. A B C

13. A stone proof is one which is taken
(A) on the imposing table
(B) on the proof press
(C) on a stone press

13. A B C

14. Twelve 12-point slugs make
(A) 24 picas (B) 12 picas (C) 48 picas

14. A B C

15. Justification is the
(A) correct placing of spaces between words
(B) making of each line of type an identical width
(C) making the type line as tight as possible in the stick

15. A B C

16. Calendering rollers
(A) put watermarks on paper
(B) form the paper against a screen
(C) put a finish on the paper

16. A B C

17. The better printing side of a paper is the
(A) felt side (B) wire side (C) either side

17. A B C

18. Halftone screens suitable for bond paper run from
(A) 85 to 100-line (B) 100 to 120-line (C) 120 to 133-line

18. A B C

19. If a ream of paper weighs 70 lbs., the substance weight of that paper is
(A) 35 lbs. (B) 70 lbs. (C) 140 lbs.

19. A B C

20. A paper 25 x 38—70M when compared with a paper 32 x 44—104M is
(A) heavier (B) lighter (C) the same weight

20. A B C

21. Paper expands and contracts
(A) more with the grain than against the grain
(B) more against the grain than with the grain
(C) equally both ways

21. A B C

22. Thumbnail sketches are made
(A) the same size as the completed job
(B) smaller than the completed job
(C) larger than the completed job

22. A B C

23. A comprehensive layout is often called a
(A) visual (B) dummy (C) copy

23. A B C

24. Display means
(A) good balance (B) good proportion (C) good contrast

24. A B C

25. In effective advertising
(A) all important elements should be displayed
(B) few elements should be displayed
(C) all elements should be displayed equally

26. Type faces appear heavier when printed on
(A) antique paper
(B) coated paper
(C) sized and supercalendered paper

27. The number of 7-point lines in 13 picas is about
(A) 11 (B) 22 (C) 36

28. Pica typewriter has
(A) 10 letters to the inch
(B) 12 letters to the inch
(C) 14 letters to the inch

25. A B C

26. A B C

27. A B C

28. A B C

DEPARTMENT OF EDUCATION, ONTARIO

GRADE 12 DEPARTMENTAL EXAMINATIONS, 1966

GRAPHIC ARTS

To be used in answering question 1

....
NAME

....
FORM

....
NAME OF SCHOOL

N.B. *Fill in the spaces above and insert this page in your examination book.*

PROOF

HOW TO MARK A PROOF

There are a great many different ways to mark a printer's proof but, no matter which one you choose, when tne edition finally comes off the press there, where it has been successfully hiding amongst the kerus and serifs, stands a *typographical* error, and, looming as large as a 72-point initial letter makes you wonder how in creation you could have passed it by. This has happened to me so often that I have at last given the up unequal struggle and now, when presented with a proof, gaze at it blankly for a minute or so and then scrawl my o.k. in the lower right hand corner, all the while hoping and praying all goes well. Of coures, if the printer's sales man lingers in the hope of getting the O.K. at once I grab the proof firmly in my left hand and with pencil poised as if in readiness for a sudden swoop, scan the proof hurriedly in a businesslike manner, mumbling to myself like a monk reading his Litany. Of the type I see little but it makes a fine impression on the printer's saleman. "Here, says he, "is no comma hound—a gentleman after my own heart, forsooth," or whatever a salesman says for forsooth

This system savesme a great deal of work throughout the year and is probably the reason I have never mastered the art of inscribing all those curious hen-tracking and hieroglyphics so beloved of the professional proofreader.

It is also probably the reason the boss assigned me to write this in a vain attempt to arouse my interest in proofreading.

To be used in answering question 1

COPY

23 picas

18 pt. Chelt Bold

HOW TO MARK A PROOF

pt. Chelt Initial

10 pt. Binny Leaded

There are a great many different ways to mark a printer's proof but, no matter which one you choose, when the edition finally comes off the press there, where it has been successfully hiding amongst the kerns and serifs, stands a typographical error, and, looming as large as a 72-point initial letter makes you wonder how in creation you could have passed it by. This has happened to me so often that I have at last given up the unequal struggle and now, when presented with a proof, gaze at it blankly for a minute or so and then scrawl my O.K. in the lower right hand corner, all the while hoping and praying all goes well. Of course, if the printer's salesman lingers in the hope of getting the o.k. at once I grab the proof firmly in my left hand and with pencil poised as if in readiness for a sudden swoop, scan the proof hurriedly in a businesslike manner, mumbling to myself like a monk reading his Litany. Of the type I see little but it makes a fine impression on the printer's salesman; "Here", says he, "is no comma hound--a gentleman after my own heart, forsooth," or whatever a saleman says for forsooth.

⊙/tr

+EN

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DEPARTMENT OF EDUCATION, ONTARIO

GRADE 12 DEPARTMENTAL EXAMINATIONS, 1966

MACHINE SHOP PRACTICE

TIME — 2½ HOURS

NOTE 1. *Your name, form, and the name of your school are to be written clearly on each examination book.*

NOTE 2. *You should obtain a set of mathematical tables from the Presiding Officer.*

Values NOTE 3. *The total value of the paper is 115 marks.*

6 1. Define any *six* of the following terms.

(*a*) cyaniding
(*b*) crush-dressing
(*c*) forming or piercing die
(*d*) tool maker
(*e*) nitriding
(*f*) milling fixture
(*g*) drill jig
(*h*) pyrometer
(*i*) critical points

3 2. (*a*) List the following Vernier readings for Figures 1, 2, and 3.

Fig. 1

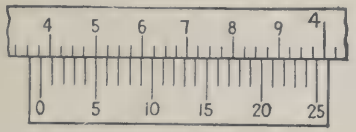


Fig. 2

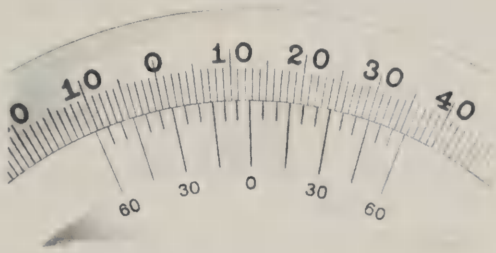
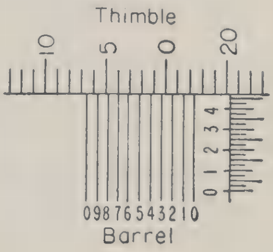


Fig. 3



[illegible] (*b*) Using an 83 piece set of gauge blocks, make *one* build-up for *each* dimension.

(i) 2.4817 (ii) .7671 (iii) 3.6666

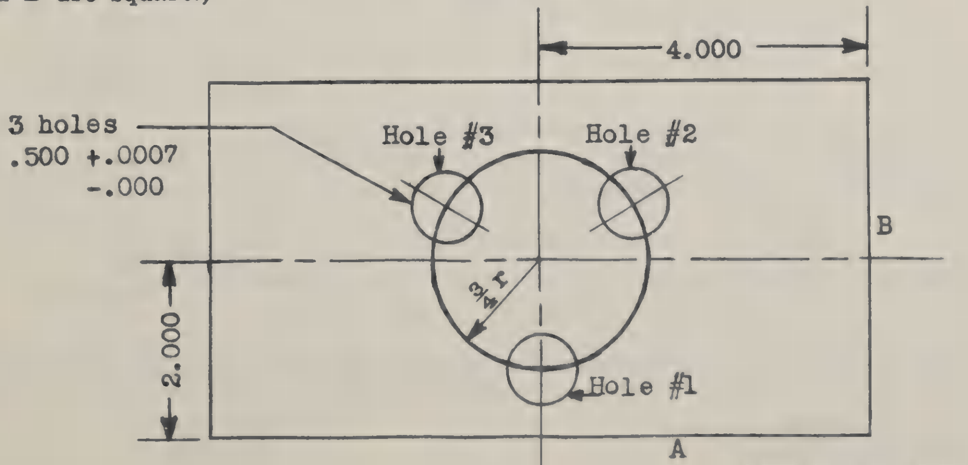
8 3. A hardened shaft must be ground to $.750 \; {+.0001 \atop -.0000}$.

Name *four* instruments which can be used to measure this work to within an accuracy of .0001, and briefly explain the principle on which *each* of these instruments operates.

18 4. (*a*) State, in point form, how to set up toolmaker's buttons and how to bore (on a lathe) *three* equally spaced .500 diameter holes on a 1½″ diameter circle. Calculate the distance from side A and side B to the centre of each hole.

OR

18 (*b*) State, in point form, how to set up and how to jig bore the same job on a jig borer or vertical mill .Calculate the distance from side A and side B to the centre of each hole (NOTE. Sides A and B are square.)



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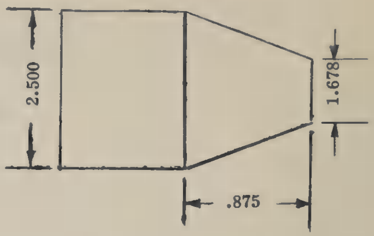
Values

5. The taper on the illustrated work piece must be machined on a lathe.



2 (*a*) Calculate the included angle of the taper.

2 (*b*) Name the method which should be used to machine the taper.

6. A $1\frac{1}{4}$″ diameter shaft requires a $\frac{1}{7}$ lead N.C. double start thread cut for a length of 3″ on one end. Use a lathe with a 6 pitch lead screw.

9 (*a*) Explain, in point form, how this thread can be produced. Include as part of your answer the method of setting up the lathe and of cutting the thread.

3 (*b*) Using the best (average) size wire, calculate the measurement over the wires for this thread.

7. A 2″ diameter C.R.S. shaft, 3′ long, is to be centred 60° x 5/16″ on a lathe. One end is held in a four-jaw chuck.

6 (*a*) List the steps required to set up the work in the steady rest.

1 (*b*) What R.P.M. is required for centring?

1 (*c*) What other machine could be used to centre this shaft if a lathe was not available?

9 8. With the aid of a fully labelled diagram, explain how the vertical head of the milling machine can be aligned to 90° with the table surface, to within an accuracy of 0.001″.

6 9. What indexing is required for *each* of the following?

(*a*) 31 grooves
(*b*) 360 grooves
(*c*) 12°20′
(*d*) 35°30′
(*e*) 15°
(*f*) 38°

The following index plates are available on the machine.

No. 1 — 15, 16, 17, 18, 19, 20.
No. 2 — 21, 23, 27, 29, 31, 33.

10. A case hardened shaft .750″ diameter and 8″ long must be hardened and cylindrically ground to size.

1 (*a*) State the allowance which should be left on the shaft for grinding purposes.

2 (*b*) Explain how this work should be prepared for grinding after it has been hardened.

3 (*c*) Explain how the cylindrical grinder should be set up for grinding the shaft.

3 (*d*) State the purpose of using two dead centres for a cylindrical grinding operation.

5 (*e*) List *five* factors which determine the selection of a proper grinding wheel.

11. A tool steel pin 0.500″ in diameter has been hardened and ground to a 6 - 8 surface micro-finish. It must be lapped to a 2 - 4 surface micro-finish.

3 (*a*) Sketch a lap designed to lap the outside diameter.

2 (*b*) What grit abrasive should be used for *each* of the following?

(i) rough lapping
(ii) finish lapping

1 (*c*) What amount oversize would you allow for lapping this $\frac{1}{2}$″ diameter pin to obtain a finished lapped diameter of $\frac{0.5002}{0.5000}$?

2 (*d*) Name *two* metals which are recommended for making lapping tools.

12. A 1090 A.I.S.I. steel has been hardened and tempered.

7 (*a*) Explain the procedure to measure the hardness on a Rockwell "C" scale.

2 (*b*) List *two* other instruments which can be used to measure the hardness of steel.

Answer *either* Question 13 *or* Question 14.

7 13. List *seven* advantages of hydraulic power transmission.

OR

7 14. What is the chief characteristic that is obtained when *each* of the following elements is added to steel?

(*a*) Vanadium
(*b*) Molybdenum
(*c*) Tungsten
(*d*) Carbon
(*e*) Nickel
(*f*) Manganese
(*g*) Silicon

DEPARTMENT OF EDUCATION, ONTARIO

GRADE 12 DEPARTMENTAL EXAMINATIONS, 1966

SHEET METAL PRACTICE

TIME — 2½ HOURS

NOTE 1. *The Presiding Officer will provide you with Part A and Part B at the beginning of the examination period.*
NOTE 2. *Your name and form, and the name of your school, are to be written clearly on each examination book, and at the top of Part B.*
NOTE 3. *The total value of this paper is 120 marks.*

PART A

Values

SECTION I — Answer Question 1 and *ONE* only of Questions 2, 3, or 4.

14 1. Give a suitable explanation for any *seven* of the following.

(*a*) static pressure	(*g*) total pressure
(*b*) thermal resistance	(*h*) threshold limit values
(*c*) triangulation	(*i*) blow (throw)
(*d*) transition	(*j*) effective temperature
(*e*) equivalent length	(*k*) wet-bulb temperature
(*f*) comfort zone	(*l*) air cleaner

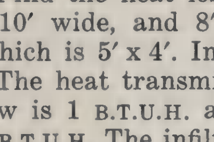
17 2. (*a*) Find the heat loss of the walls of a room which has three exposed walls. The room is 20′ long, 10′ wide, and 8′ high. Only one 20′ wall is exposed. Each 10′ wall has a picture window which is 5′ x 4′. In the 20′ wall there are two picture windows 5′ x 4′ and one door which is 3′ x 7′. The heat transmission factor of the wall is .5 B.T.U.H. The heat transmission factor of the window is 1 B.T.U.H. and of the door is 1.5 B.T.U.H. The infiltration multiplier for the window is 70 B.T.U.H. The infiltration factor for the door is 2 B.T.U.H. The outside design temperature is −10°F. and the inside design temperature is 70°F.

3 (*b*) (i) Name *three* electric controls used on an oil-fired forced-air heating system.
6 (ii) State a proper location for each, and explain why each control is so located.
4 (iii) Explain the function of *two* of the controls named above.

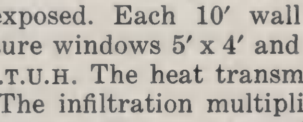
6 3. (*a*) List *three* causes of welding distortion and state the effects of each.
(*b*) Explain oxy-acetylene cutting under the following headings.
2 (i) the theory of oxy-acetylene cutting
2 (ii) the torch and nozzle used
4 (iii) the main steps in the cutting procedure
2 (iv) *two* faults and the remedy for each.

4 (*c*) (i) Name the type of joints represented by *each* of the following sketches.

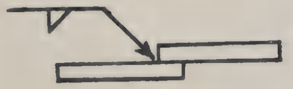
(A)



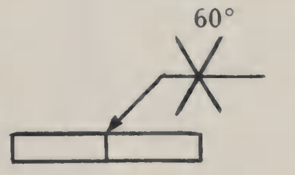
(B)



(C)



(D)



4 (ii) Explain the symbol used in *each* of the sketches shown in (*c*) (i) above.

CONTINUED OVER⟶

Values

4 (*d*) (i) Explain the meaning of each of the A.W.S. classification symbols used for the electrodes E 6010 and E 7018.

2 (ii) What are *two* indentification features used to distinguish electrodes?

4 4. (*a*) (i) List *four* metals commonly used for metal roofing.

6 (ii) State *one* advantage and *one* disadvantage for any *three* metals given in your answer to (i).

4 (iii) Compare the relative costs of the metals given in your answer to (i).

4 (*b*) (i) Sketch and name *four* seams used on metal roofs.

2 (ii) State *two* methods of making allowance for expansion and contraction in metal roofs.

2 (iii) Explain *two* methods of fastening metal roofing to a building.

8 (iv) Outline the procedure to flash a chimney which is passing through a shingle roof. The roof has a ⅛ pitch.

SECTION II

Answer *either* Question 5 *or* Question 6 (Use about two pages)

Either

16 5. Discuss the installation of a residential central air conditioning system (heating and cooling) under the following headings.

(*a*) load calculations
(*b*) unit and duct sizing
(*c*) installation procedure
(*d*) balancing

OR

16 6. Discuss cyclone separators or a dust collector system under the following headings.

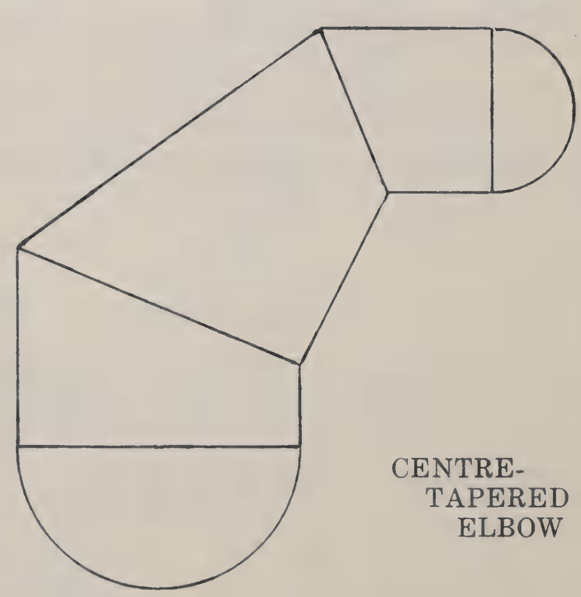
(*a*) uses
(*b*) principle of operation
(*c*) fabrication
(*d*) installation

SECTION III

Note 1. *Answer Question 7 and Question 8 in this section.*

Note 2. *Both questions are to be answered on unlined pages of your examination book. Show all the views necessary to develop the patterns required.*

25 7. Develop the stretchout patterns for the following sheet metal fitting. Seam allowances are not required.



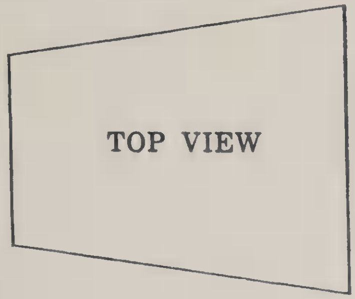
CENTRE-
TAPERED
ELBOW

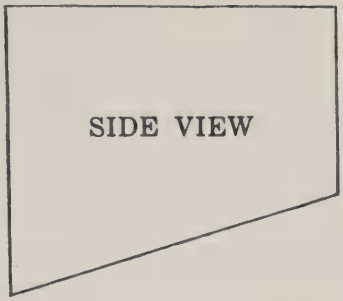
Values

Answer *either* (*a*) *or* (*b*) but not both.

Either

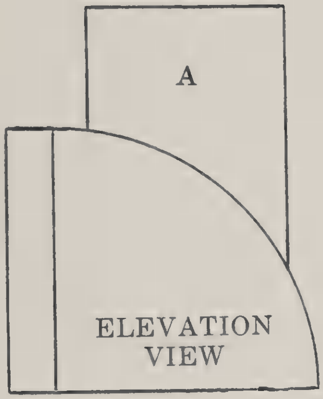
10 8. (*a*) Develop a *one-piece* stretchout pattern for the following sheet metal fitting for the size shown. Seam allowances are not required.

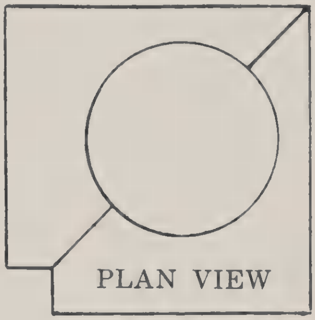




OR

(*b*) Develop the pattern for cylinder (A) that is shown intersecting a quarter-round hood at the hip.





DEPARTMENT OF EDUCATION, ONTARIO

GRADE 12 DEPARTMENTAL EXAMINATIONS, 1966

SHEET METAL PRACTICE

PART B

....
NAME

....
FORM

....
NAME OF SCHOOL

NOTE 1. *The total value of Part B is 25 marks. All items are equal in value.*

NOTE 2. *Only those answers which are indicated clearly in the answer column at the right will be marked.*

There are several suggestions for answering or completing each of the following questions or incomplete statements. Select the correct response, and circle its *letter* in the column at the right.

1. Which one of the following statements is incorrect?
   (A) Evaporation of perspiration is slower if the relative humidity of the air is low.
   (B) The body cannot lose heat by convection if the blood temperature is less than that of the surrounding air.
   (C) Air, when cooled, becomes more dense and remains near the floor of the room when subject only to gravity.
   (D) Evaporation cools because moisture, in becoming a vapour, absorbs heat.

1. A B C D

2. An open type fume hood is normally used where
   (A) grease is present in the fumes
   (B) grease must be removed from the fumes
   (C) there is a considerable amount of water vapour
   (D) no grease is present in the fumes

2. A B C D

3. Electrostatic filtering is based on the principle that
   (A) charged dirt particles are attracted to a charging plate
   (B) unlike electrical charges attract one another
   (C) the air stream passes through a bank of collector plates that have been given an electrical charge
   (D) a low voltage A.C. source is necessary to charge the collector plates

3. A B C D

4. The most satisfactory temperature for plastic welding for most applications will vary with nozzle temperatures between
   (A) 200 - 300°F (C) 450 - 500°F
   (B) 350 - 400°F (D) 550 - 600°F

4. A B C D

5. One complete air change in a modern, well-constructed office building occurs
   (A) at fifteen minute intervals (C) once every hour
   (B) every half hour (D) once every two hours

5. A B C D

6. A cooling coil
   (A) treats air by removing heat
   (B) allows room air to be removed
   (C) is usually located in the return air stream
   (D) treats air by adding moisture

6. A B C D

CONTINUED OVER⟶

7. All but one of the following statements are incorrect. Which one is correct?
- (A) The filter should always be located in the supply duct
- (B) Moisture in the air is controlled by the use of shallow drip pans
- (C) The comfort range of the body is 72° to 80°F at 45% to 50% relative humidity
- (D) Supply outlets may not be located near the floor of the room to be air conditioned

7. A B C D

8. A 48-inch length of angle iron is to be cut into two pieces—one is 5 times the length of the other. The length of one of the pieces would be
- (A) 6″
- (B) 40″
- (C) 38″
- (D) 10″

8. A B C D

9. Space limitations in modern buildings have restricted the size of air conditioning ducts. Therefore,
- (A) to convey the necessary volumes of air, higher velocities must be employed
- (B) in the interests of economy, the designer should specify a rectangular duct system
- (C) it is possible to predict that the number of mechanical units required for an installation will increase
- (D) to convey the necessary volume of air, low velocity must be employed

9. A B C D

10. To achieve minimum pressure loss in high velocity duct work, transitions should slope
- (A) 1″ to 2″ per foot
- (B) 2″ to 3″ per foot
- (C) 3″ to 4″ per foot
- (D) 4″ to 5″ per foot

10. A B C D

11. Air conditioning is defined as
- (A) the process of treating air so as to control simultaneously its temperature, humidity, cleanliness and distribution to meet the requirements of the conditioned space
- (B) the treating of air for human comfort
- (C) the process of conditioning air by heating, humidifying, filtering and circulating air in a prescribed area
- (D) the maintenance of comfort conditions to prevent acute discomfort or actual physiological damage

11. A B C D

12. When specifying supply and return outlet registers and grilles
- (A) indicate that all outlets are to be placed on exposed ductwork
- (B) indicate that all registers and grilles are to be placed in the supply system
- (C) suggest that stratification will occur at high velocity
- (D) study building plans for the size and the shape of the rooms and determine the air quantity for each room

12. A B C D

13. To produce an artificial patina on a newly installed copper roof apply
- (A) a sulphuric acid solution
- (B) an ammonium hydroxide solution
- (C) sal ammoniac and water
- (D) nitrous acid

13. A B C D

14. To heat a house erected on a slab, which of the following duct systems is most desirable?
- (A) perimeter loop
- (B) extended plenum
- (C) radial perimeter
- (D) overhead trunk

14. A B C D

15. A supply duct
- (A) allows room air to be circulated
- (B) is a pathway through which air flows to a room
- (C) distributes air evenly within a room
- (D) is a pathway through which air flows from room to room

15. A B C D

16. High velocity ducts are fabricated in
(A) round shapes only
(B) round or rectangular shapes
(C) rectangular or square shapes
(D) round, rectangular and oval shapes

16. A B C D

17. All but one of the following terms describes a type of humidifier. Which one does not?
(A) atomizer
(B) evaporator
(C) atmospheric
(D) vapourizer

17. A B C D

18. Which *one* of the following is not a polygon?
(A) square
(B) rectangle
(C) cylinder
(D) trapezoid

18. A B C D

19. The connection between the hanger and duct section is made by a sheet metal fastener. Which *one* of the following does not belong in this classification?
(A) blind rivets
(B) sheet metal screws
(C) powder actuated fasteners
(D) "pop" rivets

19. A B C D

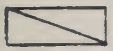
20. Make-up air is important
(A) for the elimination of odours
(B) to insure that exhaust hoods operate properly
(C) to eliminate combustion wastes
(D) to insure the operation of natural stacks such as combustion flues and vents

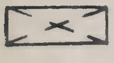
20. A B C D

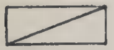
21. Which *one* of the following is not required to test and balance low pressure ventilating and air conditioning systems?
(A) pitot tube
(B) tachometer
(C) pedometer
(D) anemometer

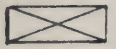
21. A B C D

22. One of the following symbols represents a supply duct section. Indicate the proper symbol.

(A) 

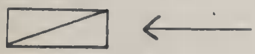
(B) 

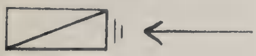
(C) 

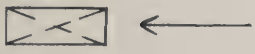
(D) 

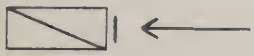
22. A B C D

23. Which *one* of the following commercial symbols indicates an exhaust grille?

(A) 

(B) 

(C) 

(D) 

23. A B C D

24. Rectangular ducts for low velocity systems measuring 43″ through 54″ on the horizontal side should be fabricated from
(A) 24 gauge galvanized iron
(B) 22 gauge galvanized iron
(C) 20 gauge galvanized iron
(D) 18 gauge galvanized iron

24. A B C D

25. A section of round duct must travel from a point on the floor, 10 feet from a wall, to a point on the wall 8 feet above the floor. The length of duct required is
(A) 12.6 ft.
(B) 12.8 ft.
(C) 13.2 ft.
(D) 14.8 ft.

25. A B C D

DEPARTMENT OF EDUCATION, ONTARIO

GRADE 12 DEPARTMENTAL EXAMINATIONS, 1966

WELDING

TIME — 2½ HOURS

NOTE 1. *The Presiding Officer will provide you with Part A and Part B at the beginning of the examination period. Allow approximately twenty minutes for Part B.*

NOTE 2. *Your name and form, and the name of your school, are to be written clearly on each examination book and at the top of Part B.*

PART A

Values

SECTION I. *Answer ALL questions in this section.*

3 1. (*a*) Explain how a welding transformer reduces the high input voltage to a low output voltage.

1 (*b*) Why should E6010 electrodes not be used with a-c welding machines?

2 (*c*) Give *two* reasons why E6011 electrodes are suitable for a-c and d-c operation.

2 (*d*) Explain how a rectifier type D.C. arc welding machine converts the A.C. input to a D.C. output.

5 2. (*a*) Compare T.I.G. welding equipment and metallic arc welding equipment under the following headings:

- (i) electrodes
- (ii) shielding of the arc
- (iii) filler metals
- (iv) torch assemblies
- (v) regulators

3 (*b*) List *three* advantages T.I.G. welding has over metallic arc welding.

5 (*c*) Make a sketch showing the power cable, adapter coupling, hose line and gas line assemblies for a T.I.G. welding torch.

4 3. Define the following welding terms.

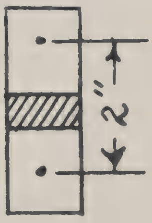
- (*a*) hot shortness
- (*b*) duty cycle
- (*c*) admixture
- (*d*) gas solubility

SECTION II. *Answer EITHER question 4 OR 5 but NOT BOTH*

3 4. (*a*) State the procedures for making a quick etch on a weld cross-section in order to check for penetration and soundness.

2 (*b*) Make a drawing showing the edge preparations of the plates, for *one* of the Canadian Welding Bureau Structural Steel Tests. Show all dimensions.

3 (*c*) A standard specimen as shown on the sketch is marked with two punch marks spaced exactly 2″ apart. It is then placed in a tensile testing machine and pulled until fracture occurs. The fractured ends are held together and the distance between the punch marks is now found to be 2.50″. What is the percentage of elongation? Show all calculations.



OR

2 5. (*a*) Define impact and abrasion. Give an example to illustrate each condition.

2 (*b*) Describe *one* type of hard-facing electrode that is used on parts subject to abrasion.

2 (*c*) Explain why stainless steel electrodes are used for the hard-facing of parts that must withstand severe impact.

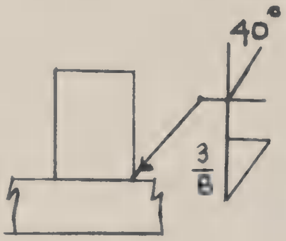
2 (*d*) How does the weld deposit from a tubular tungsten carbide electrode resist wear? Explain clearly.

CONTINUED OVER→

Values

7 6. Draw complete end views to represent the following welding symbols.

(1)



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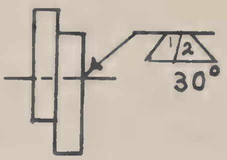

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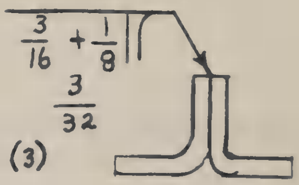

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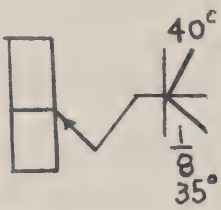

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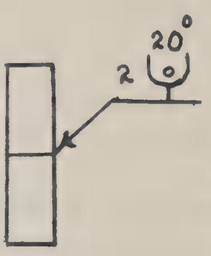
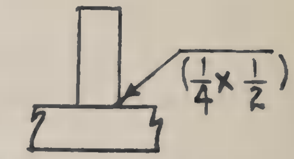


(6)



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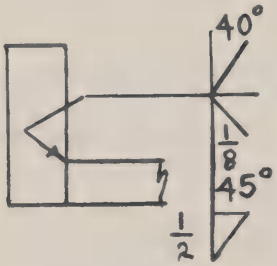


2 7. (*a*) When making a multiple pass butt weld on a thick piece of steel, what effect has the second layer of weld on the underlying bead?

3 (*b*) Give *three* causes for underbead cracking.

OXY-ACETYLENE WELDING

SECTION III. *Answer ALL questions in this section.*

3 8. (*a*) Name *three* types of cast iron and state a use for each type.

1 (*b*) Which type of cast iron is most widely used in industry?

1 (*c*) Explain why this type of cast iron is in such demand.

3 (*d*) List *three* reasons for using flux when welding cast iron by the oxy-acetylene process.

1 9. (*a*) Why is it necessary to use a larger tip for welding aluminum than for welding steel of the same size and thickness?

1 (*b*) State the most important reason for using flux when welding aluminum.

2 10. (*a*) Draw a sketch of the neutral flame, showing
(i) the temperature of the inner cone
(ii) the temperature of the outer envelope.

3 (*b*) Explain why a carburizing flame is used when applying hard-facing rod to the surface of a low carbon steel.

2 (*c*) Why is it possible to join two dissimilar metals by bronze welding?

Values

4 11. Draw a simple diagram of a two-stage oxygen regulator. Show on the diagram how the oxygen enters the regulator and the method by which the cylinder pressure is reduced to a pressure suitable for welding.

2 12. (a) State the two changes that take place in carbon steel when it is heated to its upper critical temperature.

5 (*b*) Describe briefly the following types of heat treatment for carbon steels.

(i) normalizing
(ii) hardening
(iii) tempering
(iv) refining
(v) annealing

1 13. (*a*) Why should high carbon steel be preheated before it is welded?

2 (*b*) Draw a simple graph showing the carbon content and the critical range for carbon steels.

3 (*c*) Explain how you would anneal:

(i) a piece of work-hardened aluminum
(ii) a piece of work-hardened copper
(iii) a hardened file.

SECTION IV. *Answer any THREE questions in this section.*

2 14. State *two* reasons why white metal is difficult to weld by the oxy-acetylene process.

2 15. Make a sketch showing the proper alignment of the preheat holes in the torch tip when cutting a bevel.

2 16. Why is stainles ssteel so difficult to cut with an oxy-acetylene cutting torch?

2 17. Describe how capillary action takes place when silver brazing.

DEPARTMENT OF EDUCATION, ONTARIO

GRADE 12 DEPARTMENTAL EXAMINATIONS, 1966

WELDING

PART B

....
NAME

....
FORM

....
NAME OF SCHOOL

NOTE 1. *All items in Part B are of equal value. One mark is allowed for each correct answer for a total of 15 marks.*

NOTE 2. *This Part of the examination paper is to be handed in with your answer book.*

There are four suggestions for answering or completing each of the following questions or incomplete statements. In each case determine the correct response and circle its *letter* in the answer column at the right.

1. Reverse polarity refers to
   (A) the reversal of the alternating current 120 times per second
   (B) the flow of current from the welder to the electrode on direct current
   (C) back-step welding on a selenium rectifier
   (D) the backward flow of current in the overhead position

1. A B C D

2. Residual stresses are due to
   (A) non-machineable electrodes on the wrong polarity
   (B) sudden cooling of the weld area
   (C) capillary action in the welded zone
   (D) electrodes having a tensile strength under 60,000 p.s.i.

2. A B C D

3. Using nickel steel electrodes will result in
   (A) welds in cast iron that are machineable
   (B) excessive re-inforcement in the welded zone
   (C) strong welds with T.I.G. equipment
   (D) ductile welds on aluminum

3. A B C D

4. High frequency is used in T.I.G. welding to
   (A) change the frequency of current from straight to reverse
   (B) help the gas expansion in the welded zone
   (C) initiate the starting of the arc on aluminum
   (D) provide continuous welding on stainless steel using direct current

4. A B C D

5. The addition of manganese to steel
   (A) decreases the hardenability and tensile strength
   (B) increases the hardenability and tensile strength
   (C) changes the direction of flow of the electrons
   (D) decreases the deposition rate

5. A B C D

6. Low hydrogen electrodes are generally used to
   (A) resist impact forces
   (B) weld cast iron
   (C) resist penetration
   (D) weld high-sulphur steels

6. A B C D

7. Before welding, aluminum castings should be preheated to a temperature between
   (A) 1500-1750°F
   (B) 1000-1500°F
   (C) 1250-1450°F
   (D) 500-800°F

7. A B C D

8. Which of the following metals should never be fusion welded by the oxy-acetylene process?
   (A) grey cast iron
   (B) cast aluminum
   (C) white metal
   (D) malleable cast iron

8. A B C D

CONTINUED OVER→

9. The free carbon in the grain boundaries of grey cast iron exists in one of the following forms

(A) droplets
(B) charcoal
(C) graphite
(D) carbon monoxide

9. A B C D

10. The melting temperature of grey cast iron is

(A) 2500°F
(B) 1800°F
(C) 1000°F
(D) 3000°F

10. A B C D

11. Which of the following structures will be found in a piece of normalized .83% carbon steel?

(A) sorbite
(B) pearlite
(C) austenite
(D) martensite

11. A B C D

12. A piece of steel containing more than .83% carbon is indentified by one of the following terms or words

(A) hyper-eutectoid
(B) hypo-eutectoid
(C) iron carbide
(D) eutectoid

12. A B C D

13. Which of the following statements is incorrect?

(A) cast iron is hard to cut with a standard cutting torch
(B) stainless steel can be cut by powdered iron injection
(C) cutting is not a chemical process
(D) a lance is used to cut heavy castings

13. A B C D

14. White cast iron that has been subjected to a long annealing process is called

(A) pig iron
(B) manganese steel
(C) grey cast iron
(D) malleable cast iron

14. A B C D

15. Chromium and nickel-chromium steels are called

(A) manganese steel
(B) high speed tool steel
(C) stainless steel
(D) low carbon alloy steel

15. A B C D

DEPARTMENT OF EDUCATION, ONTARIO

GRADE 12 DEPARTMENTAL EXAMINATIONS, 1966

WOODWORKING
(Building Construction, Cabinet Making and Millwork, and Pattern and Casting Processes)

TIME — 2½ HOURS

NOTE 1. *A complete paper is composed of eight questions, four having a value of 10 marks each, and four having a value of 15 marks each, to make a total of 100 marks. Questions may be selected entirely from one section or from a combination of sections, but four having a value of 15 marks and four having a value of 10 marks are to be selected. The value of each question is indicated in the margin.*

NOTE 2. *Your name, form, and the name of your school are to be written clearly on each examination book.*

Values

SECTION I — BUILDING CONSTRUCTION

10 1. Describe the procedure used to apply a laminate such as Arborite or Formica to a sink counter top 2′ - 0″ x 8′ - 0″ with a 4½″ back splash, the top to have a finished outer edge 1½″ deep faced with laminate.

10 2. Make a neat line sketch of a gable roof and indicate the following roof terminology.

(*a*) span
(*b*) run
(*c*) total rise
(*d*) pitch
(*e*) length per ft. run
(*f*) rise per ft. run
(*g*) plumb cut
(*h*) seat cut
(*i*) ridge board
(*j*) overhang

10 3. (*a*) Describe *two* basic methods of preventing heat loss in a building.

(*b*) Name *three* types of insulation commonly used in a house and explain where they are used.
(*c*) What is the purpose of roof vents?
(*d*) Calculate the number of square inches of roof vent area necessary for a gable roof having a total ceiling area of 25′ - 0″ x 36′ - 0″.

10 4. (*a*) Make a sketch of a 14″ I beam showing 2″ x 8″ joists framed into the sides of the beam and label all parts. The joist is to be supported on ledger strips.

(*b*) Name *two* types of bridging.
(*c*) What is the purpose of bridging?
(*d*) Describe the application and characteristics of *two* types of sub-flooring.

15 5. Make a sketch of a typical house foundation wall, showing the following parts. (Label each part clearly.)

(*a*) footing
(*b*) box sill construction for a house of frame construction
(*c*) the accepted method of making the basement damp-proof

15 6. Sketch *each* of the following types of roof cornice and label the parts clearly.

(i) boxed (ii) open (iii) crown and frieze

15 7. Using the rafter tables provided determine the length in feet and inches to the nearest ⅛″ of the common, hip and the longest jack rafter for a full hipped roof of 28′ - 0″ span and 48′ - 0″ long. The rafters are spaced at 16″ o.c. The pitch is ⅓ rd.

(*a*) What would the plumb and seat cuts be on the common rafter?
(*b*) What figures would be used on the framing square to obtain the side cut on the jack rafters?
(*c*) What would be the length of the ridge board?
(*d*) How many common rafters will be needed?
(*e*) How many jack rafters will be needed?
(*f*) How many hip rafters will be needed?

CONTINUED OVER⟶

Values

15 8. A closed string stair is required for a house which has a floor to floor height of 8′ - 9″.

(*a*) Calculate the number and height of risers needed.
(*b*) Calculate the number and width of treads required.
(*c*) What will be the total run of the stair?
(*d*) What is the minimum headroom for a house stair?
(*e*) What is the height of the handrail on the stairway?
(*f*) What is the height of the handrail on the landing?

SECTION II — CABINET MAKING AND MILLWORK

10 9. (*a*) Distinguish between contemporary furniture design and period furniture design.
(*b*) State *three* elements of design and give an example to describe each.
(*c*) Explain briefly *four* principles of design.
(*d*) Why is a layout rod more useful than a drawing for a machine operator?

10 10. (*a*) Name *six* areas of growth which appear in the cross-section of an angiosperm tree trunk.

(*b*) Describe briefly where fluids pass through the trunk of a living tree.

(*c*) Classify wood waste as logs are converted into dressed lumber. (The term wood waste is used here to imply that a sawmill generally has no use for it other than fuel.)

10 11. List, in point form, the procedure which should be followed to finish and rub *one* of the following types of table.

a light walnut table to receive a dark walnut varnish finish using an oil or NGR stain

OR

a light mahogany table to receive a dark mahogany lacquer finish using water stain

10 12. (*a*) State, in point form, *three* basic steps required to sharpen *either* an auger bit *or* a gouge which has a poorly shaped cutting edge.
(*b*) Give *three* characteristics of carbide tools.
(*c*) Name *three* methods of conditioning a circular saw blade to provide clearance.
(*d*) When should a circular saw blade be side jointed during sharpening procedure?

15 13. (*a*) Explain *each* of the following window-sash terms.

(i) light
(ii) horn
(iii) glazed
(iv) muntin
(v) bedding

(*b*) Draw a sectional view of the bottom portion of a double-hung window frame with trim applied. Identify the parts you have drawn.

15 14. (*a*) Describe *two* methods of providing a door stop on the jambs of a door frame.
(*b*) Which method of stopping a door is generally used for an exterior door?
(*c*) State *three* reasons why sliding doors are often preferable to hinged doors on cupboards and cabinets.

(*d*) Describe, in point form, the procedure which should be followed to cut and fit *either* a standard butt hinge on a door and cabinet (flush set) *or* a pivot hinge on a door and cabinet (overlay).

15 15. (*a*) How is the size of any *five* of the following machines determined?

(i) circular saw machine
(ii) band saw machine
(iii) jointer machine
(iv) single-surface thickness planing machine
(v) stroke-sanding machine
(vi) lathe machine
(vii) moulding machine

(*b*) Describe briefly *four* changes that have taken place during the past quarter century in the construction of stationary woodworking machines.

(*c*) Why are coated-abrasive belts being used for an increased percentage of sanding work today?

(*d*) Explain how you would bandsaw a curved table leg from a squared piece of stock. (The leg design has been drawn on two surfaces which are at right angles to each other.)

(*e*) Give *two* safety precautions which should be taken before attempting maintenance on any machine.

Values

15 16. (*a*) Name *four* types of frames used in the construction of cupboards and cabinets and indicate their function in the projects.

(*b*) Sketch *one* method of supporting a vertical series of drawers in a cabinet *without* the use of frames. Label the sketch.

(*c*) When is it absolutely necessary to center-guide a drawer for smooth operation?

(*d*) Draw and identify a suitable wood joint to join *either* a drawer side to an overlay drawer front *or* a centre drawer guide to the front rail of a frame.

(*e*) Give *three* basic methods of supporting shelves and state *one* advantage for *each*.

SECTION III — PATTERN AND CASTING PROCESSES

10 17. Define briefly the meaning of the following terms.

(*a*) tail-coreprint
(*b*) fillets
(*c*) cheek
(*d*) master pattern
(*e*) parting line
(*f*) sand permeability
(*g*) refractory wash
(*h*) runner
(*i*) drysand core
(*j*) gang core box

15 18. (*a*) From the list below choose *three* types of gating systems and make *three* sketches showing the position of the gating system in relation to a mould cavity.

(i) parting line gating
(ii) centrifugal gating (whirl gate)
(iii) step gating
(iv) horn gating
(v) branch gating

(*b*) For *each* of the *three* types of gating systems selected in part (*a*) of this question give the following information.

(i) the reason or principle involved in using each system
(ii) one disadvantage of each system

15 19. (*a*) Explain fully *three* advantages the centrifugal casting process would have over the conventional sand casting process in producing a large number of soil pipe castings 8′ - 0″ long.

(*b*) Why can the following advantages of permanent mould casting not be duplicated by conventional sand casting?

(i) casting tolerances of 0.010 of an inch can be guaranteed
(ii) cores $\frac{1}{4}$″ in diameter may be formed using metal pins
(iii) when large numbers of small identical castings are required, the cost per casting is lowered
(iv) castings have a finer grain structure with the result that they have a greater strength and soundness
(v) each casting is substantially a duplicate of the preceding one

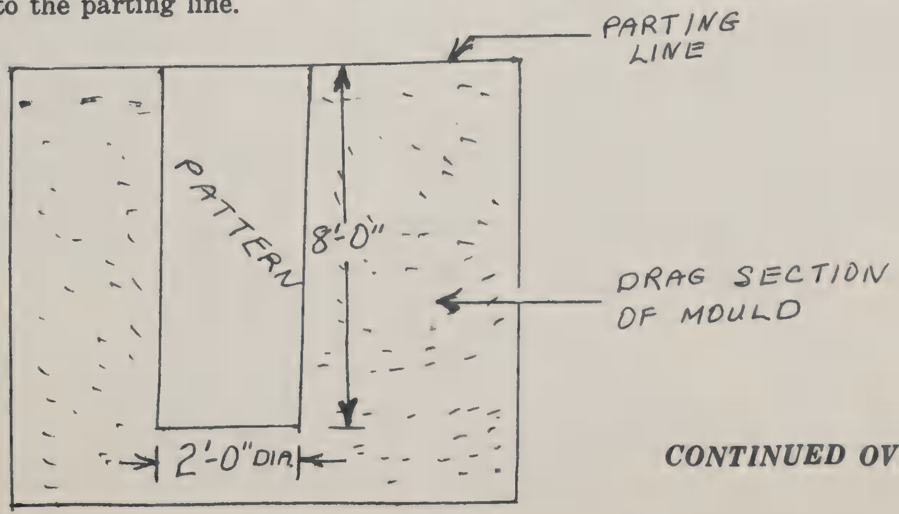
(*c*) What is the main difference between permanent mould casting and die-casting?

(*d*) Explain why a casting weighing approximately 200 pounds and having thin sections, can not be successfully die-cast.

10 20. (*a*) Give *three* reasons for increasing the normal machining allowance usually allowed on a pattern for machining the casting.

(*b*) How can the misalignment of the cope and drag sections of a split pattern be avoided?

(*c*) Explain why the pattern shown in the sketch below should not be rammed in a vertical position relative to the parting line.



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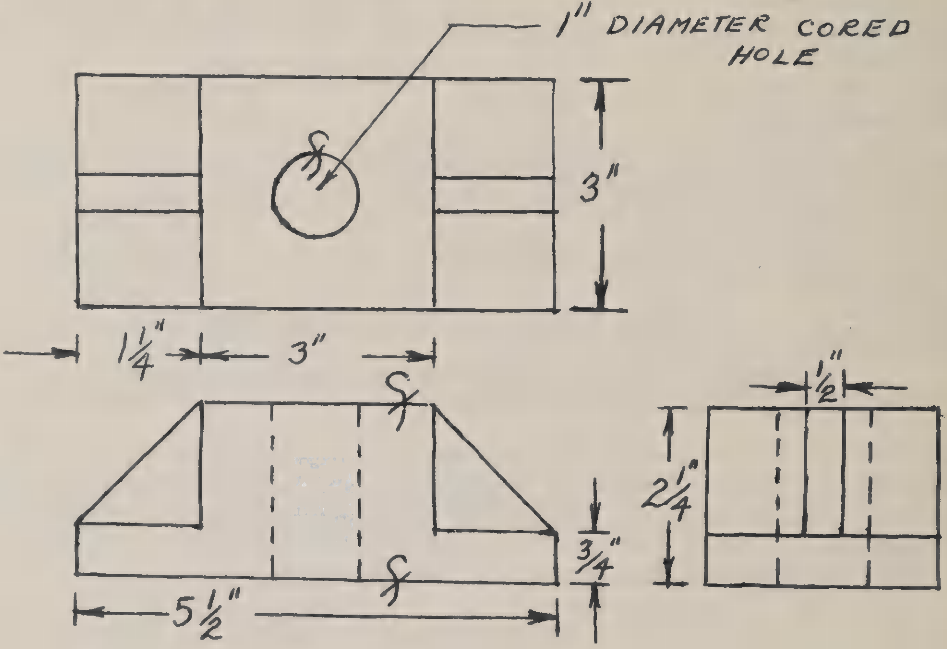
Values

(*d*) What main factor will decide whether a dry sand core should be made in a half or a full core box if the core is such that it can be made in either one?

10 21. (*a*) Explain, in point form, the procedure followed in using the Magna-Flux Process for checking castings for defects.

(*b*) A casting of a steel ring 10′ - 0″ outside diameter, 8′ - 0″ inside diameter and 10″ high is required. The pattern is made using a shrinkage scale exclusively to produce the casting. When the casting is taken from the mould it is found to be greatly oversized. Explain fully the correct method to be followed in making a pattern which produces the correct sized casting.

15 22. One thousand cast iron castings of the shape shown below are required.



(*a*) What pattern equipment would you recommend to produce these castings economically? Explain fully the reasons for your choice.

(*b*) Calculate the weight of the casting before machining. (Cast iron weighs .2604 lbs. per cubic inch.)

(*c*) Calculate the total cost of the castings if the metal sells for 20.5 cents per pound.

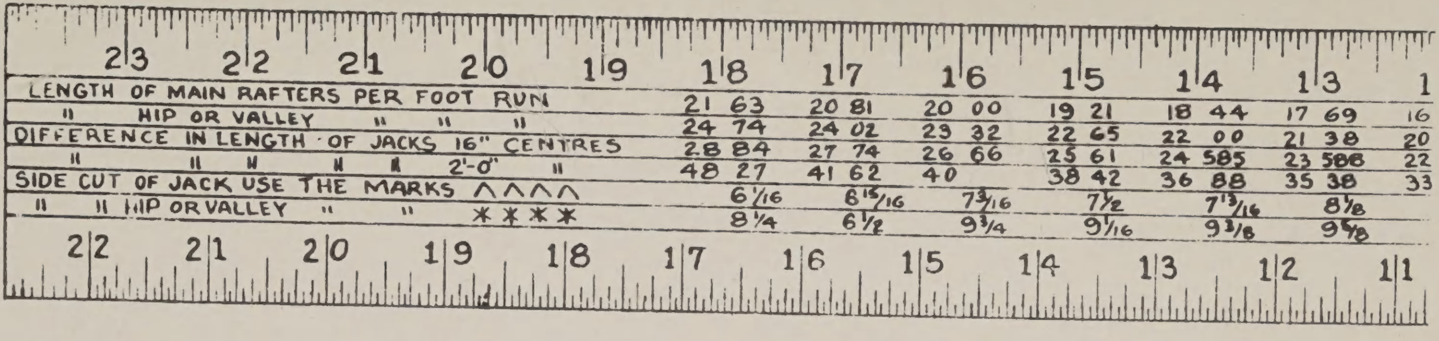
10 23. (*a*) Explain fully why a thermosetting plastic is the best type for casting patterns.
(*b*) Give *two* reasons why the drawing qualities of plastic patterns are said to be excellent.
(*c*) Give *three* reasons why a filler is added to a plastic used in patterns.
(*d*) Explain fully why plastic patterns can be made more cheaply than metal patterns.

15 24. (*a*) Give examples of *two* types of patterns for which segmental construction may be used. Sketches may be used to illustrate your answer.

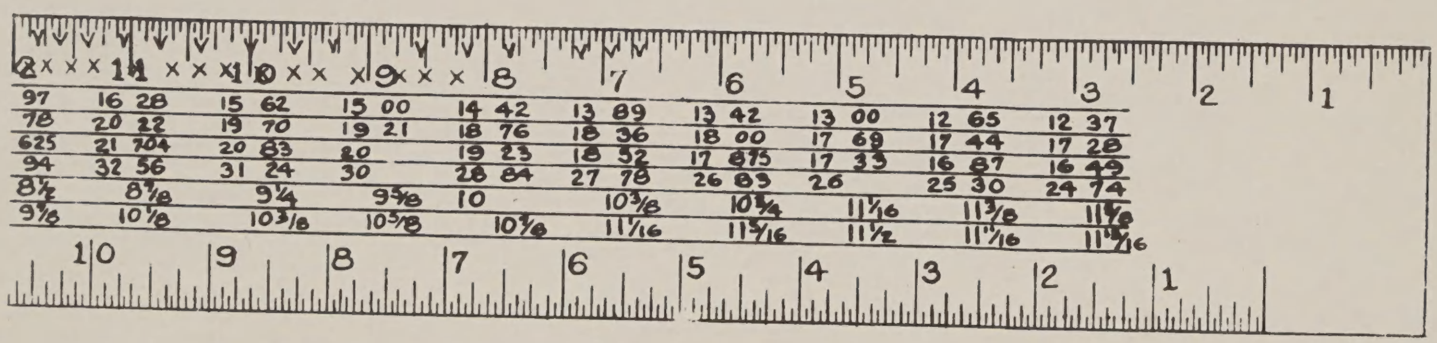
(*b*) List at least *three* advantages of segmental construction and explain how each of these advantages is obtained.

(*c*) Define what is meant by the term irregular parting and explain in what circumstances it may be used. Sketches may be used to illustrate your answer.

(*d*) A large number of 3″ cast iron hexagon nuts are required. Explain fully in point form, the procedure you would follow to make a 12″ x 18″ cast matchplate, using a plaster mould to produce these castings.



	18	17	16	15	14	13	1
LENGTH OF MAIN RAFTERS PER FOOT RUN	21 63	20 81	20 00	19 21	18 44	17 69	16
" HIP OR VALLEY " " "	24 74	24 02	23 32	22 65	22 00	21 38	20
DIFFERENCE IN LENGTH OF JACKS 16" CENTRES	28 84	27 74	26 66	25 61	24 585	23 588	22
" " " " " 2'-0" "	48 27	41 62	40	38 42	36 88	35 38	33
SIDE CUT OF JACK USE THE MARKS ^^^^	6 1/16	6 15/16	7 3/16	7 1/2	7 13/16	8 1/8	
" " HIP OR VALLEY " " ****	8 1/4	6 1/2	9 3/4	9 1/16	9 3/8	9 5/8	



12	11	10	9	8	7	6	5	4	3
97	16 28	15 62	15 00	14 42	13 89	13 42	13 00	12 65	12 37
78	20 22	19 70	19 21	18 76	18 36	18 00	17 69	17 44	17 28
625	21 704	20 83	20	19 23	18 52	17 875	17 33	16 87	16 49
94	32 56	31 24	30	28 84	27 78	26 83	26	25 30	24 74
8 1/2	8 7/8	9 1/4	9 5/8	10	10 3/8	10 3/4	11 1/16	11 3/8	11 5/8
9 3/8	10 1/8	10 3/8	10 5/8	10 7/8	11 1/16	11 5/16	11 1/2	11 11/16	11 13/16